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A MONOGRAPH OF THE JUMPING PLANT-LICE OR PSYLLIDÆ OF THE NEW WORLD

BY

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WASHINGTON
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Richard Ratnbun,
Assistant Secretary, Smithsonian Institution,
In charge of the United States National Museum.

Washington, D. C., *April 30, 1914.*

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A MONOGRAPH OF THE JUMPING PLANT-LICE OR PSYLLIDÆ OF THE NEW WORLD.

By David L. Crawford,[1]

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INTRODUCTION.

The family Psyllidæ, or the Jumping Plant-lice, have received comparatively little attention in the New World, especially from the systematic point of view. A relatively small number of species have been described, but no serious attempt has been made to relate the several genera represented by these species.

The European forms have received a great deal of attention, notably by Dr. Franz Loew and now by Dr. Karel Sulc. Others have made some contributions, but in a much more unrelated manner. With the two names just mentioned, the name of Witlaczil should not be omitted. Some very good work on the internal anatomy has been done by him.

Until 1848 only a few genera were recognized, most of the species being placed in *Psylla*. At that date Foerster divided *Psylla* into several smaller genera, most of which are still valid. In 1878 Loew published his Zur Systematik der Psylloden, in which he established several additional new genera and tabulated four subfamilies—Triozinæ, Psyllinæ, Aphalarinæ, and Liviinæ. With the exception of the latter, these were separated from each other on the basis of wing venation characters.

In his subsequent work he followed this same system of classification and there soon appeared more subfamilies and many more genera. Other workers during and since his time have employed his system of classification, also. The basic diagnostic characters used by Loew in this system were largely venational. The presence or absence of the cubital petiole (M+Cu), and the relative length of this petiole, when present, and the radial stem (or discoidal subcosta), were the two principal characters for the separation of subfamilies.

In undertaking systematic work on a large collection of Psyllidæ some four years ago, Loew's system of classification was employed because it was practically the only one to be used. The collections before me were very large and contained very large series of specimens of many species, in which there would naturally be more or less variation. It was soon found that by Loew's system very closely related species were thrown into different genera and even different subfamilies. Sometimes, too, specimens of the same species were separated into different subfamilies. This was true especially of several species of *Aphalara* and of related genera.

---

[1] Contribution from the Entomological Department of Cornell University, Ithaca, New York. This supersedes the former papers by the author on this group.

As the work progressed and other large collections were studied, many unsatisfactory features were found in this system and a great many difficulties encountered. Some of these have been mentioned in more or less detail in my former papers on this group. It became apparent that any classification based principally on wing venational characters would be artificial and unsatisfactory. At the same time other characters were noted that seemed to be more fundamental and whose use in classification seemed to place together certain obviously related genera.

The form of the head, for instance, was found to be very significant in diagnosis. In some genera the frons is a visible sclerite between the genæ, while in others it is completely covered by the genæ which in the latter case are nearly always produced into conical processes. Genera related or separated on this character were found to be distinctly related or separated in other structural characters, as well.

The form of the vertex, and that of the pleurites of the prothorax and of the pronotum, the armature of the hind tibiæ, and several other structural characters, have been found to correspond closely in certain groups of genera. These, naturally, do not divide the genera into sharply defined groups, but the groupings are, at least, more sharply defined and less artificial than by Loew's system.

As a result of this study, a complete rearrangement of the genera of Psyllidæ is herein presented. While only the American genera are treated in this monograph, yet most of the genera of the world have been considered in connection with this new system of classification, and it appears that this system will be very satisfactory for all.

The American genera have been arranged in six subfamilies—Liviinæ, Pauropsyllinæ, Carsidarinæ, Ceriacreminæ, Triozinæ, and Psyllinæ. Some of these are new names and those which have already been used are here used with different limits, representing a different group of genera. Each is described and discussed under its own subhead and need not be discussed here. It should be noted, however, that the old subfamily Aphalarinæ is not recognized. Its typical genus, *Aphalara,* has been transferred to the group Liviinæ, and the other genera formerly placed in it have been referred to Psyllinæ or some other subfamily.

Some confusion has arisen in the past over differences in the nomenclature of the external sclerites, and these differences have been due largely to our imperfect knowledge of the homologies of these external parts. In the following pages a brief discussion of the homologies of the sclerites is given, with an explanation of the terms used in the systematic portion of this work.

MORPHOLOGY.

Anatomical studies on the family Psyllidæ are not numerous, but in proportion to the systematic work on the group they are quite extensive. All of this work has, however, been based on a relatively small number of species and therefore the results are not entirely accurate.

The most extensive of these works was by Emmanuel Witlaczil in 1885, Die Anatomie der Psylliden. The largest and most important part of this paper is on the internal anatomy, with a relatively small part on the external morphology. He discusses in more or less detail the following subjects: Segmentation of the body wall, musculature, wax glands, tracheal system, nervous system, digestive canal, circulatory system, reproductive organs, and finally the relationships of the family to the other groups of Homoptera, both the Phytophthires and the higher groups.

Loew (**'76**:187–194) discusses very briefly the external anatomy, but in a very general way. H. B. Stough (**'10**:121–165) has more recently studied the morphology of the hackberry psyllid, *Pachypsylla c.-mamma* Riley. This latter work is not altogether satisfactory from the point of view of clarity and definiteness, and also shows several errors in the interpretation of sclerites. It may be stated, however, that the species of *Pachypsylla* are among the most difficult for the purpose in view—of homologizing sclerites of Psyllidæ with those of other Homoptera—and this may account for the errors.

Some very good work has been done by Miss Patch (**'09**:117–121) on the wing veins of Psyllidæ, homologizing them with the veins of Aphididæ, Coccidæ, and Aleyrodidæ. The Comstock-Needham system of nomenclature of veins as applied to many other groups of insects has been applied here by Miss Patch. Because of its simplicity and superiority in all ways the same nomenclature is followed in the taxonomic work of the present paper.

No attempt has been made by the writer to go into the internal anatomy of the Psyllidæ; nor is the external morphology presented in as much detail and completeness as would be desirable if the scope of the present work were not so limited. There are many very curious and remarkable developments in the members of this family, and several sclerites which are difficult to homologize satisfactorily with other Homoptera. These must be studied more carefully before the conclusions can be relied upon with absolute certainty. Certain phases, therefore, of the external morphology are presented in somewhat of a tentative manner.

The present study has been based on a large number of species, representing many genera of the family, as follows: *Livia vernalis* and *L. coloradensis*, *Aphalara veaziei*, *Pauropsylla* sp. (a Javanese species), *Paurocephala magnifrons*, *Apsylla cistellata* (Indian), *Phacopteron lentiginosum* (Indian), *Heteropsylla texana*, *Euphyllura arbuti*, *Arytaina robusta*, *Psyllopsis fraxinicola*, *Psylla alni americana*, *Psylla pyricola*, *Trioza diospyri* and *T. albifrons*, *Paratrioza arbolensis*, and many others compared but studied less carefully.

Apsylla cistellata, an Indian species, is somewhat generalized and proved to be very valuable for indicating the path of specialization in the more highly specialized forms, or these considered to be more typical of the family. It was pointed out in the description of this species (Crawford '12c:421, 429) that it was scarcely psylline in many respects, and in fact the generic name, *Apsylla*, was suggested by that fact. Many developments so complicated and so highly specialized in *Psylla* that it is extremely difficult to understand them become much clearer when the Indian species is compared with them.

The methods of study used have been both gross dissections and microtome serial sections in balsam. The dissections were made in a liquid—alcohol, cedar oil, or glycerine being the best, and for most purposes alcohol the best—and under a binocular microscope with a magnification of about sixty diameters. The specimens were first softened, cleared and distended in a warm, strong solution of caustic potash and then placed in a watch glass on the microscope stage with a strong tungsten light directly beneath the stage. In this way the sclerites of the exo-skeleton become easily visible because of the semitransparent and distended condition of the body wall. By means of fine needles and special tweezer-like scissors the insect may be very easily dissected.

Another method of dissection which proved to be very valuable and which is offered as a suggestion to others for similar work is as follows: Soak the specimens in warm caustic potash for ten or twelve hours, then place in water for a few minutes, and dehydrate with alcohol; then soak in cedar oil for several hours and imbed in paraffine. With a microtome, section away one-half of the insect, either longitudinally or sagitally, dissolve away the paraffine from the remaining unsectioned half with xylol, and mount in balsam with the cut surface up. No staining is necessary unless a chitin stain is used in cases where the body wall is mostly depigmented and transparent. A half insect mounted with the open side up shows with remarkable clarity and perspective the internal skeleton and the internal side of the sutures. This method was found to be valuable also for the study of the musculature, but of course for this the specimen must be first fixed alive instead of soaking it in caustic potash.

As a third and very essential method of study serial sections of specimens fixed in various fluids were used. Transverse, sagital, and longitudinal sections were made.

HEAD.

Figs. 1, 3, 5, 15, 17, 21.

The head of the members of Psyllidæ in the essential parts is not materially different from that of other Homoptera. In appearance it is very variable within the family because of the peculiar prolongations of the genæ or the vertex or some other part of the head.

The *vertex* is a large dorsal sclerite comprising usually most or all of the top of the head and divided by a median suture which is always easily visible (fig. 5). At the extreme posterior angles of the vertex are the two posterior ocelli. The surface of the vertex is variable, being sometimes flat, or more often with irregular depressions or foveæ; or sometimes rounded forward and downward. Its shape also is variable from quadrate to triangular or semicircular, or each of the two lobes may be rhomboidal.

The *frons* has in most cases been overlooked in the Psyllidæ and the clypeus erroneously called the frons. In *Psylla*, *Trioza*, and many other genera the frons is scarcely visible as a sclerite, but in some species it is very prominent, as, for instance, in *Paurocephala magnifrons* (fig. 16) and *Livia*, *Aphalara*, and several other genera. In all cases it is present as a small or large sclerite bearing the anterior ocellus at its base or the end nearest the vertex. In many species of *Psylla* the ocellus is imbedded between the vertex and the genæ and no frons is at first apparent. After careful examination, however, the small sclerite of the frons becomes visible below the ocellus and between and beneath the genal cones (figs. 15, 21).

The shape and form of the frons is very variable. In *Paurocephala magnifrons*, a Mexican species (fig. 16), it is a relatively large, conspicuous, pentagonal sclerite occupying an anterior position on the head (actual, not relative), with the vertex articulating on the two sides, the genæ on two sides and the clypeus on the fifth side or apex. The anterior ocellus is at the base, the same relative position as in all the other species. The sutures and sclerites are almost diagrammatically clear in this species.

In *Livia* (fig. 20) *Rhinocola*, *Aphalara* (fig. 18), *Aphalaroida*, *Paurocephala* (fig. 16), *Pauropsylla*, *Heteropsylla*, some species of Carsidarinæ, and others the frons is very distinct but occupies an inferior position on the head and is more elongate and the sutures sometimes less distinct than in the Mexican species mentioned above. In these forms, too, the anterior ocellus is borne at the base of the frons (the apex of the head), and the frons appears sometimes as the stalk of the ocellus. As stated above, the frons in *Psylla* and many other genera has been suppressed and becomes almost invisible in some cases. In *Pachypsylla* it is so small and indistinct that Mr. Stough overlooked it as a sclerite and called it the "ligamentary process attaching the frons (really the clypeus)[1] to the head." Figure 15 is from a sagital section through the front ocellus and the frons. The suture between the vertex and the frons is very distinct just above the ocellus. The frons is seen to extend downward beneath the genal cones which lie over it and to attach to the clypeus a little farther down (fig. 15).

A complete and very interesting series may be found within the family, showing the suppression of the frons from a large and prominent sclerite to a very small one which is little larger than the ocellus attached to it. The variation of the frons in many other groups of the Homoptera is very similar, and there is little doubt but that a comparative study of this sclerite throughout the whole suborder would throw much light on the taxonomy of the group and the relations of the families within the group.

The *genæ* are very large and comprise the largest part of the head ventrad.[2] In *Livia* (fig. 20) the genæ are two sclerites, lying one on each side of the elongate frons and between the vertex in front and the clypeus behind. In all cases the antennæ are attached on the edge of the genæ near the vertex. The variation in the form and shape of the head is due mostly to the variability in the form of the genæ. From the simple condition as mentioned above for *Livia* there is a gradual pushing outward of the genæ to form two spherical lobes or two conical processes projecting downward or forward. These processes have had various interpretations, and various names have been assigned to them. Some writers have called them frontal cones, or frontal lobes, or frontal processes; Slingerland called them "cones of the clypeus"; Loew and other European writers have called them *stirnkeln*, and *coni frontales*. The writer in previous papers has called them facial cones, a noncommittal term. Stough is inconsistent in recognizing the sclerites from which these cones arise as the genæ and yet calling these processes *frontal cones*, and at the same time calling the clypeus the frons, a sclerite which has no relation to the cones whatever. The term *genal cones* is applied to these processes in the taxonomic work of the present paper, and, of course, this is the only possible interpretation of them.

Usually the genæ are inferior in position, but in some species of Carsidarinæ, notably in *Carsidara* (figs. 150, 151) a part of the top surface of the head—what appears to be the vertex—is formed by the genæ. The vertex consists of a pair of narrow oblique lobes with the front ocellus far from the front margin of the head, and the genæ forming the front part of the head with the antennæ attached on their front margin. In *Euphyllura*, also, a part of the top of the head is formed by the genæ (figs. 34, 36).

---

[1] The parenthesis is my insertion.

[2] In all of this discussion the position of the sclerites is described as actually found in the Psyllid head, and not as in the typical or generalized insect.

Behind the eyes is another sclerite, the *occiput*, which is often not easily distinguished from the genæ, although the suture between it and the vertex above is always distinct. In *Livia* this is very large and extensive (figs. 3, 20), and the sutures are distinct. In most of the genera, however, it is less extensive and more closely fused with the genæ. The occipital foramen is surrounded by this sclerite.

The *clypeus* is a relatively large sclerite and very prominent. It is usually pyriform or cordate in shape, but sometimes more or less conical (*Aphalara calthae*, *Paurocephala ilicis*, and *Ceropsylla johnsonii*). The large end usually overlaps on the frons and often covers a large part of the latter, as in *Psylla*, *Trioza*, and many other genera. It is often obscured from view from in front by the genal cones which project downward in front of it. The other end converges rapidly toward the labrum and labium (fig. 15). The suture between the clypeus and labrum is quite distinct (in a good preparation), dividing off a relatively small and short labrum. Stough ('10: pl. 29, fig. 1) has indicated an extra suture in the clypeus, and thus the proper number of sclerites is obtained after omitting the frons and calling it the ligamentary process. The epipharynx is a very small and inconspicuous sclerite.

Appendages of the head.—The labium in the Psyllidæ is very peculiar in being sharply flexed at a point between the forecoxæ and the distal portion extending perpendicularly downward. This distal portion only is movable, the basal part being held rigidly between the forecoxæ. The basal segment is thin, being membranous in appearance but really well chitinized. It is more or less internal, being covered partially by the prosternum. At the beginning of the second segment, or at the tip of the first, the labium makes a sharp turn and passes downward. If the head were in the normal position of a generalized insect, this sharp turn would be perpendicularly upward. The furcæ from the prosternum are large and heavily chitinized. The second labial segment passes down directly in front of this and is apparently supported and strengthened by it. In some species, *Psylla alni americana* for instance (fig. 15) it seems to be partially surrounded by the furcæ. The labium passes out between the legs of the furcæ and immediately behind the forecoxæ, thus appearing to arise from the prosternum instead of the head. The distal portion of the second segment and all of the third is outside and forms the visible *beak* or *rostrum*. The latter is movable and may be exserted and drawn in more or less, being movable on, or within, the profurcæ.

The mandibular and maxillary setæ are attached near the base of the clypeus and pass out along the labium. They are very long, often very much longer than the labium.

The *eyes* are large and usually more or less hemispherical, projecting laterad from the side of the head. The facets are relatively very large. In *Livia* (fig. 20) the eyes are peculiarly flattened, and are peculiar, too, in having a tubercle (*pre-ocular tubercle*) projecting partly into their front margin. This resembles very much an ocellus and may possibly be some kind of a sense organ. There are three ocelli, as mentioned above; two on the vertex and one on the frons.

The *antennæ* are nearly always ten-segmented, rarely nine- and only abnormally eleven-segmented. They are attached to the genæ near the margin of the vertex, sometimes near the lateral margin of the genæ, and sometimes more toward the front. The first two segments are always larger and shorter than the following joints. The third is nearly always the longest, the others each being shorter than the preceding one. The terminal segment is thickened a little and bears two thick setæ of unequal length. In some genera (*Paurospylla* and others) these setæ are half as long as the antennæ. Scattered over the surface of the intermediate segments are hairs, probably sensory, which in some species, *Homotoma* species for instance, are very abundant. There are also a considerable number of sensory areas of various kinds, some being simple differentiated rings or pits, and others being of a rather complicated structure. Further study of these undoubtedly will bring to light many interesting forms of sensory apparatus. The living psyllid moves the antennæ rapidly and almost continually; sometimes the movement is so rapid that it might well be called vibration.

THORAX.

Figs. 1-4, 6-12.

In proportion to the rest of the body the thorax of the Psyllidæ is very large. It has become specialized by the habits of leaping of the insect, and is not only large and strong but some of the sclerites are most remarkably developed. This is true especially of the meso- and metathorax.

The *prothorax* is short. The notum consists of a single sclerite which is arched over behind the head. The extent to which it reaches downward on each side varies in the different genera. In *Livia* it is large and extends down laterad to the forecoxæ (fig. 3), while in *Psylla* and *Trioza* it extends only about halfway down toward the coxæ (figs. 1, 4, 6-8). Near each lateral extremity, in most species, is a foveal impression which sometimes is very prominent. The lateral extremity may be more or less swollen and knoblike, as in

Aphalara (fig. 166) or it may be uniform to the margin and the suture between it and the pleurites indistinct.

The *pleurites*, in most genera, are easily visible, but in *Livia* they are less so (fig. 3). The pleural suture is distinct, extending from the base of the forecoxæ to the lateral extremity of the pronotum. The episternum may be equal in size to the epimeron, or it may be larger, but it is seldom smaller. A small trochantin is usually visible at the lower end of the episternum.

The taxonomic value of the form of the pleurites of the prothorax has been emphasized elsewhere in this paper. In some genera, as in *Aphalara* (figs. 1, 166), the pleural suture extends to the middle of the knoblike lateral extremity of the pronotum, while in others, as in *Psylla* (figs. 4, 8), it is oblique and extends to the posterior edge of the lateral extremity of the pronotum, and the latter is not knoblike. The episternum is often more or less covered by the receding eye and occiput (*Euphyllura*, fig. 35), or both pleurites may be so covered. The epimeron often is partially concealed by the conjunctival membrane between the pro- and mesothorax.

The *prosternum* is greatly reduced in most genera, the forecoxæ being contiguous and occupying most of the space. In *Apsylla*, however, the prosternum is much larger and the forecoxæ are not contiguous (fig. 9). In fact, the condition in this genus in this regard resembles very much the nymph of the more specialized genera. In the latter genera the furcæ of the prosternum are strongly developed, as pointed out in connection with the labium. The attachment of the furcæ on the sternum is not strongly chitinized, but a short distance from the base they become very thick and strong, forking about midway from base to apex. The apical arms are very heavy and knobbed at the end and roughened. Several very large muscles are attached here.

Between the pro- and mesothorax are three small chitinized sclerites which are not visible on a dried specimen unless it be distended by means of a warm liquid. One of these is the peritreme bearing the mesothoracic spiracle and is, therefore, not part of the prothorax. Lying close to the upper margin of the peritreme and sometimes not separated from it is a second sclerite which is sometimes small and elliptical and extends only a little above the upper edge of the propleurites, and sometimes long and narrow and extends far up between pro- and mesonotum. In *Apsylla* these two sclerites are one (fig. 2), while in *Trioza albifrons* (fig. 7) they are divided only by a line. In other species they have become more or less separated, but it seems obvious from the two species mentioned above that the upper sclerite is only a part of the peritreme, which has become separated for some reason from the lower part. Stough called this upper sclerite the epimeron of the prothorax, having overlooked or disregarded the pleural suture in what he calls the episternum (really both pleurites).

The third of the sclerites is not so easily accounted for. Judging from its position behind the peritreme it can hardly be prothoracic. It is quite evident that it is an accessory sclerite, but its homology in other insects is not certain at present. Stough does not show this in his figures, although it is present in all the species that I examined, including *Pachypsylla*, with which he worked.

Mesothorax.—The mesothorax is the largest part of the thorax, being both long and broad and well adapted for muscle attachment. The præscutum (often called the *dorsulum*) is always as long as the mesonotum and very often much longer. The anterior edge is somewhat flexed upward to hook into the posterior margin of the pronotum. The lateral margin is not so low as that of the pronotum, but a long, narrow process extends from this margin down and a little backward to the mesepisternum, articulating with the latter somewhat below the wing base. In many species, notably *Apsylla cistellata* (fig. 2), there seems to be a suture dividing this process at its base from the præscutum. Whether this is a true suture or only an internal ridge is difficult to state. It seems more reasonable that it is only a ridge and that the part in question is a real process and not a distinct sclerite.

The *scutum*, sometimes spoken of as the mesonotum, is a large and heavy sclerite. It is separated from the præscutum and scutellum by prominent furrows externally and ridges internally. There is a strong articulation between this and the episternum near the wing base and epimeron behind the wing base.

Between the lateral process of the præscutum and the anterior margin of the scutum and the wing base are two tuberculous sclerites, the anterior one being often large and very conspicuous. These are evidently the paraptera, which in most other insects are simple sclerites and not knob-like or tuberculous. Behind the wing base and near the end of the axillary cord is a third parapteron, but this is not swollen as the others are.

The *scutellum* is very much smaller than the scutum and is hemispherical in shape with a long slender axillary cord extending down laterad from it to the wing base and forming part of the latter.

The *postscutellum*, or pseudonotum of Verhoeff and Snodgrass,[1] is a very short sclerite behind the scutellum and extends down laterad beneath the axillary cord in the basal portion and then behind it from there on, articulating at its apex with the epimeron.

The *mesopleurites* are very large and extensive, forming a large part of the entire pleural region. The wing base is a large bifurcate process, with the axillary cord usually fused with it and forming part of the attachment base for the anal angle of the wing.

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[1] Snodgrass's The Thorax of Insects and the Articulation of the Wings (Proc. U. S. Nat. Mus., 36: 511-595, 1909), has been used continually in these interpretations of the thoracic sclerites.

The *pleural suture* is distinct from the coxa to about the middle of the pleura, but from the wing process downward to this point it is usually either obsolete or very indistinct. In *Apsylla*, however, and also *Livia* and *Euphyllura* and perhaps other genera the suture may be traced to the base of the wing process, its course being rather tortuous. A little above the coxæ may be seen the lateral apodemes of the mesopleuræ, as invaginations on the pleural suture. The lower end of this suture is at the articulatory condyle of the mesocoxa and usually meets the margin of the episternum at the same point.

The *episternum* is somewhat larger than the epimeron and has a long line of articulation with the mesosternum in front of the coxa. The epimeron articulates above with the postscutellum and also with the scutum and below with the coxa. Below the wing base in many species is a more thinly chitinized and impressed area of irregular outline.

The *mesosternum* also is very large and extensive, forming even more of the sternum relatively than the mesonotum does of the entire thoracic dorsum. It extends forward to the forecoxæ and is flexed upward at this point with the anterior margin arcuate inward to allow for the labium which passes out behind the forecoxæ. From near the posterior margin, between the mesocoxæ, arise the mesofurcæ. These are a little larger than the profurcæ, and the end of each arm is broadened out T-shaped to facilitate muscle attachment. A narrow prolongation of the sternum extends back between the coxæ, but not beyond this point.

Metathorax.—The metathorax presents more remarkable developments and specializations than any other part of the body. This is especially true of the pleuræ and the endoskeleton and has been caused by the habit of leaping which has necessitated unusually strong attachments for the relatively gigantic muscles found in the thorax of these insects.

The *metanotum* is much smaller and less conspicuous than the mesonotum. The praescutum of the metanotum is almost or completely suppressed. The scutum forms the largest part of the notum and articulates with the wing process of the hind wings. The scutellum is similar in shape and appearance to the mesoscutellum, but is usually smaller. An axillary cord extends down from it to the wing process, as in the mesothorax, and forms the point of attachment for the anal angle of the hind wing.

The postscutellum, or pseudonotum, is much larger than that of the mesothorax, and is very often produced into a pair of horn-like processes or very prominent ridges. It extends down laterad and articulates with the epimeron.

The *metapleuræ* have been very much changed from their original simple condition and show complications which are difficult to understand without a more generalized form, as *Apsylla*, to compare with. In the more highly specialized species (which include nearly all) the metacoxæ have become enormously enlarged and have pushed far up into the pleural region nearly up to the tergum and have displaced the pleurites from their normal position. A careful examination of *Apsylla* (figs. 2, 9, 12) first will aid greatly in interpreting the sclerites and sutures in the other species.

The *pleural suture* is distinct in *Apsylla*, extending from the wing process to the articulatory condyle of the metacoxa at the uppermost point of the latter. The metacoxa is not much larger than the mesocoxa and does not extend very far upward. The episternum is much larger than the epimeron and bears the metathoracic spiracle near its anterior margin. This is not a distinct sclerite, peritreme, as it is in the other species, but the chitin between the spiracle and the part of the episterum posterior to the spiracle is thinner. The episternum articulates on its lower margin with the small metasternum, which is a small, narrow sclerite between the meta- and mesocoxæ. A rather large trochantin articulates with the rest of the lower margin of the episternum and with the sternum.

The *epimerom* is broad above, articulating with the postscutellum on its posterior corner. A thickened ridge passes down its posterior edge to the articulatory condyle of the coxa, and at this point the epimeron, still thickened, is flexed backward and passes down behind the coxa. Here it turns inward and unites with the corresponding prolongation of the epimeron of the other side, and together they fuse with the end of the metasterum, which is described below.

The *metacoxa* is more or less cordate and not very much larger than the mesocoxa. By reflected light it appears to be uniformly thick throughout, but by transmitted light, when the specimen has been well cleared, a distinct thickening along the posterior edge is easily visible. This thickened ridge becomes broader below. From near the coxal cavity, caudad, there projects a thick spiniform process, the *meracanthus* or *coxal spur*. This appears to be articulated and is not a true process.

In the more highly specialized species the metacoxa, as already stated, has become very enormously enlarged and has pushed far up into the pleura. A comparison of *Apsylla* (fig. 2) and *Psylla alni americana* (fig. 4) shows very plainly that this pushing upward of the coxa has been between the pleural suture and the posterior thickened ridge of the epimeron. As a consequence, the pleural suture in *Psylla* does not extend to the upper end of the coxa, but terminates in front of and below that point. The lower extremity of the episterum articulates with the sternum, which is even smaller and more reduced than in *Apsylla*. The trochantin is larger and articulates with the coxa in front and well below the upper end. Along this margin of the episterum next to the trochantin inside there is a ridge, which extends upward along the corresponding margin of the epimeron and articulates with the coxa at its uppermost point and passes on downward behind the coxa to unite with the corresponding process from the other side and with the sternum, as described for *Apsylla*.

The metacoxa is similar to that of *Apsylla*, except that it is much larger and the posterior thickening is more marked and conspicuous, while the anterior part is thinner. Stough went widely astray in his interpretation of the metathorax. The thickened posterior part of the metacoxa he called the epimeron and the remainder he called the coxa. The pleurites he did not attempt to explain or show, except his supposed epimeron.

The *sternum* of the metathorax is, in the generalized *Apsylla*, rather similar to that of the mesothorax, but much smaller. It is a narrow, though easily visible, sclerite between the meso- and metacoxæ with a narrow projection extending back between the metacoxæ and mostly covered by them so that it is scarcely visible from directly beneath. This narrow process articulates with the two prolongations from the two epimera which project downward behind the coxæ.

The *metafurcæ* arise from the posterior part of the sternum ventrad, near the point from where the posterior prolongation begins. They are about one-half larger than the mesofurcæ and of similar shape and form, except that the apices are more flattened out and broadened (fig. 12). The lateral apodemes are small but distinct, and show plainly the position of the pleural suture (figs. 2, 12).

In *Psylla*, and practically all the genera except *Apsylla*, the sternum and metafurcæ are very much more complicated. The sternum is scarcely visible from beneath, except a small sclerite at the lower end of each metepisternum. This extends upward (shown in fig. 1 by dotted lines) between the meso- and metacoxæ, and is visible only by dissection, being concealed by the coxæ (figs. 10, 11). The posterior prolongation is, therefore, a little farther up from the venter and is larger and longer because the metacoxæ are larger and it must reach to the posterior margin of the latter. At the posterior margin of the coxæ the sternum articulates with the prolongations of the epimera in exactly the same manner as in *Apsylla*.

The metafurcæ are not simple and small, as in *Apsylla*, but are exceedingly long and complicated (figs. 10, 11) in their structure and articulations with the other parts of the body. The two main forks of the furcæ pass upward arcuately to the dorsum of the metathorax and extend backward to beyond the posterior margin of the postscutellum, projecting into the base of the abdomen. About half way between the fork and the apex is an arcuate transverse process connecting the two arms of the furcæ; extending from each arm a little further distad is a process connecting with the post-coxal prolongation of the epimeron; another, a little more proximal of the latter process, unites with the ridge on the internal side of the margin of the epimeron and episternum in front of the coxa (figs. 1, 10, 11). This is the form in several species of *Psylla*. In other genera there are minor differences, but the principal features of the endo- and exoskeleton are the same.

The musculature of the thorax, and especially of the metathorax, is very remarkable and interesting, but it will not be discussed here. It scarcely needs to be said that these peculiar developments of the metafurcæ and metasternum are for muscle attachment.

APPENDAGES OF THE THORAX.

Wings (fig. 395).—The wings, four in number, are membranous, though sometimes the anterior pair is thickened and leathery. The shape is variable from elongate-ovate to rhomboidal. The venation is simple, and presents relatively few striking differences throughout the family.

The media and cubitus have fused at the base with the radius, and only one principal basal vein is present (R+M+Cu). This divides near the base into either three (Triozinæ) or two veins. In the latter case the posterior of the two veins (M+Cu, or the *cubital petiole*) divides again into the media and cubitus. The upper fork, radius (R), gives off the radial sector (Rs) about midway in its course to the costa (C). The radius may unite with the costa directly or it may turn near the costa and follow parallel with it for a distance before uniting with it. The space between the costa and radius, in the latter case, is called the *pterostigma*. The radial sector passes to the apical portion of the wing and is branched only in exceptional cases.

The medial vein is branched once near its apex, forming M_{1+2} and M_3, and the cell thus formed is called the *second marginal cell*. The cubitus, also, forks once into Cu_1 and Cu_2, forming the first *marginal cell*. The claval suture dividing the clavus and corium is near the base, extending from the base to near the tip of Cu_2. Only one anal vein is present, and that is very short and near the base. The veins, and sometimes the membrane, are beset with fine or coarse hairs.

The venation of the posterior wings is even more simple, the wings themselves being much smaller and more delicate in texture. R_1 is wanting, the first vein behind the costa being the radial sector. The media is unforked at the end. The cubitus divides, as in the primary wing, into Cu_1 and Cu_2. A short anal vein is sometimes present.

Legs.—The coxæ are large and subglobose or ovoid, the metacoxæ being very much larger and more complicated in their structure (see discussion of the metapleuræ above). The fore- and metacoxæ are usually contiguous, while the middle pair are not.

The trochanter is freely movable in the acetabulum of the coxa. The femur is long and large, and the hind pair are well supplied with muscles for springing. The tibia is as long as or longer than the femur and relatively slender. In many genera there is a spur at the base, and in all the genera there are from three to many black spines at the apex.

The tarsi are two-segmented. The apical segment bears two large sharp claws with a long seta between them. The basal segment in most genera, except Triozinæ, bears two large claw-like spines at the apex, one extending out on each side of the distal segment.

ABDOMEN.

Figs. 1, 8, 13-14.

The number of segments in the abdomen is reduced below the number in the typical or generalized insect. There are five easily visible segments besides the genital segment in the female and six plus the genital segment in the male. In addition to this there are several segments reduced or suppressed and several represented by the gonapophyses in both sexes. The total number has been said by Witlaczil and others to be ten, while Heymons [1] shows eleven to be the total number in the several genera of Homoptera, though Psyllidæ are not explicitly included. I find that the latter, eleven, is correct.

The first segment has been said to be fused with the metathorax as a propodium. This is not possible according to the position of the first spiracle. Stough ('10:151) states that there are seven spiracles on the abdomen. In *Psylla pyricola* (figs. 13, 14) and in all of the other species which I have examined there are eight in both sexes. Two are between the metathorax and first tergite. The latter is much reduced and is not the first of the large tergites. There are two very small chitinized sclerites below these and before the first large urite. It is obvious that these are two atrophied urites and represent two suppressed abdominal segments. The tergites of the first two seem to be wanting entirely, while that of the third is present as a reduced sclerite. The fourth to eighth tergites, inclusive, are distinct enough. The ninth segment in the female is represented by the ventral valve of the genital segment. The tenth is represented by the ovipositor sheath within the genital segment and the eleventh segment by the dorsal or anal valve of the same genital segment. The eighth urite is suppressed. In the male the segments are similar up to the ninth. The ninth tergite is suppressed

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[1] Heymons, R. Beiträge zur Morphologie und Entwickelungsgeschichte der Rhynchoten, 1899.

but the urite is well developed. The tenth segment is represented by the ventral genital valve, bearing the forceps on its upper margin. The eleventh segment is the *anal valve*, the dorsal sclerite bearing the anal opening at its extremity. The term supra-anal plate applied by some to this sclerite is hardly correct, for it is not above the anus, as the term implies, but bears the anus; hence the term *anal valve.*

The spiracles are quite dependable for the interpretation of the abdominal segments, and it seems obvious that the above statements are correct. However, the best and surest method of determining the actual number of the segments is by embriological studies. Until such studies are made the conclusions can not be absolutely certain.

LOCOMOTION.

The Psyllids are usually very active little creatures and often difficult to catch without the aid of a net. The rapid movement is a combination of leaping and flying. When disturbed a psyllid throws itself into the air by means of its powerful hind legs, and once in the air it vibrates its wings and thus increases the rapidity of movement and the distance covered. The wings are scarcely strong enough to permit of rapid or prolonged flight unaided by the preliminary leap. By this combined leaping and flying, however, the insect is able to travel several yards, although more often it merely leaps a few inches or feet from the point of disturbance.

The hind legs are much larger and longer and more muscular than the others. The femur is directed backward, the tibia bends forward and the tarsi backward. For leaping, the insect doubles the tibiæ close up under the femora and the tarsi close under the tibiæ, and fastened firmly by means of the claws. The tarsi are so short that the claws are nearly under the trochanter, when the leg is doubled for leaping. By suddenly extending the tibiæ by means of the powerful muscles in the femora and coxæ the body is thrown upward and forward. This may be most easily understood if one folds a piece of paper in the form of a Z with the base short, and performs the motions described above.

RELATIONS TO OTHER HOMOPTERA.

It seems apparent from the morphological studies on this family that it is less closely related to the Aphididæ, Aleyrodidæ, and Coccidæ than has been heretofore supposed. Many things point to a close relationship with the higher Homoptera, especially the Cicadoidea, and the Membracidæ, and related families. The writer is not yet prepared to make any definite statement in this regard. It is to be hoped that more work will be done in the future with a view to establishing the true relationships between the families of Homoptera. The sclerites of the head and thorax, the number of abdominal segments present and suppressed, many features of the internal anatomy, the form of the gonapophyses and many other things indicate a much closer relationship with the higher Homoptera than has been generally supposed.

COLLECTING AND PRESERVING.

The Psyllidæ, like most Homoptera, are to be found on trees or smaller plants, sucking up the plant juices by means of the long beak. They may be collected with a sweep net, or with tweezers if the insects are not too active—as they often are. The external skeleton is hard enough so that the insect will retain its form after drying. For this reason they may be killed in a cyanide bottle and preserved on paper triangles or minuten nadeln. Or, they may be placed in 70 per cent alcohol and preserved indefinitely in this way. Specimens may be sent by mail, also, in either manner.

If possible, all stages of the insect, nymphs as well as imagines, should be preserved. The nymphs are best preserved in 70 per cent alcohol. As much data as possible regarding the host-plant, time of year, locality, elevation, etc., should be secured and should accompany the insect either by means of lot numbers or else on the pin or in the vial of alcohol.

Specimens for study should be mounted on a paper triangle or minuten nadeln, and not mounted in balsam. The shape and natural form of much of the body surface is not readily visible, because of distortion, in balsam mounts. The finer details of the genitalia, however, are best seen by clearing and mounting the cauda in balsam.

DETERMINATIONS FROM IMMATURE STAGES.

Determination of the species when only the nymphal form is available is quite impossible at present. No serious attempt has been made thus far to work out a system of classification based on nymphs only. As soon as sufficient material for this work becomes available, the writer expects to undertake such a task. At present, however, the best that can be done is to determine, sometimes, the subfamily to which the nymphs belong.

In general, the nymph possesses a flattened oval body, with the long beak on the ventral surface near the center. There are usually three or four instars. After the first molt the wing pads become visible on the anterior half of the dorsal side. The body is often covered or fringed with variously shaped hairs.

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EXPLANATION OF DESCRIPTIONS.

Since the two sexes differ very little in this family, except in the genitalia, one description is given for both the male and female of each species, followed by a description of the genitalia first of the male, then of the female. If any other secondary differences between the sexes do occur, these are noted in the general description.

SYSTEMATIC TREATMENT.

SYNOPSIS OF THE SUBFAMILIES.

a^1. Head deeply cleft in front, with the antennæ attached to the truncate anterior ends on each side of cleft (see fig. 122); genæ seldom produced into conical processes; furcation of media not dichotomous (see figs. 395 and 492); hind tibiæ often with a spur at base.......................................CARSIDARINÆ.

a^2. Head not as above (head may appear to be cleft, but this is due to the genal cones, and the antennæ are not attached to the ends of these).

  b^1. Frons not covered by genæ; genæ not produced into conical processes (except in *Calophya*); front ocellus at extremity of frons.

    c^1. Vertex flat and horizontal, with frons beneath it in the form of a narrow (usually elongate) sclerite from clypeus to front ocellus; wings often more or less thickened and maculated.................................LIVIINÆ.

    c^2. Vertex rounded downward in front, not horizontal, with frons as a distinct sclerite usually forming a uniformly smooth surface with vertex and genæ; wings usually membranous.............................PAUROPSYLLINÆ.

  b^2. Frons covered by genæ; genæ usually produced into conical processes (genal cones); front ocellus imbedded between vertex and genæ.

    c^1. Forewing with more than the usual two marginal cells, the additional ones (or one) being formed by the branching of the radial sector or a cross vein from same to media.......................................CERIACREMINÆ.

    c^2. Forewing with only the usual two marginal cells, formed by furcation of media and cubitus; radial sector not branched and without cross vein to media.

      d^1. Basal tarsal segment of hind legs without a pair of black, claw-like spines at tip; radius, media and cubitus usually diverging at same point from basal vein; wings usually angulate at apex...................TRIOZINÆ.

      d^2. Basal tarsal segment of hind legs with two black, claw-like spines at tip; the three veins not diverging at same point from basal vein, but media and cubitus with a common stem (cubital petiole); wings rarely angulate at apex...PSYLLINÆ.

Subfamily LIVIINÆ.

This subfamily is characterized chiefly by the flattened head, the inferior position and the shape of the frons, the form of the genæ, the short antennæ and more or less thickened wings.

Head flat, not deflexed; vertex longer or shorter than broad; frons beneath vertex, not covered by genæ, visible as a narrow (usually elongate) sclerite from clypeus to front ocellus; genæ more or less swollen beneath vertex, never conical. Antennæ usually short, rather thick. Eyes compressed (Liviini), or bulging more conspicuously (Aphalarini). Thorax scarcely arched; sutures not deeply impressed. Wings more or less thickened, variable in shape and venation.

SYNOPSIS OF GENERA.

a^1. Eyes greatly flattened, not hemispherical; vertex longer than broad; pronotum extending far down laterad toward coxæ; wings thickened........Tribe *Liviini*.
One genus............*Livia* Latreille.

a^2. Eyes more or less hemispherical; vertex not longer than broad..Tribe *Aphalarini*.
  b^1. Pronotum extending down laterad to below lower surface of eyes; vertex about as long as broad; genæ not swollen; wings thickened........*Rhinocola* Förster.
  b^2. Pronotum not extending down laterad as far as lower surface of eyes, shorter with a knob-like lateral termination; vextex broader than long; genæ somewhat swollen.
    c^1. Vertex flat, more than half as long as broad; genæ only slightly swollen; wings usually ovate, hyaline, often maculated; male anal valve with a long posterior horizontal lobe..................................*Aphalara* Förster.
    c^2. Vertex shorter, not as flat as in above genus; genæ more swollen but not covering frons; wings more or less thickened and rhomboidal; male anal valve not as above..................................*Aphalaroida* new genus.

Tribe LIVIINI.

Genus LIVIA Latreille.

Head not deflexed, as broad as prothorax and closely joined to it; vertex flat, usually longer than broad, more or less rectangular in outline, apical portion thin; frons not covered by genæ, visible as an elongate sclerite beneath vertex from clypeus to front ocellus; genæ somewhat swollen, never produced into cones; eyes greatly flattened, scarcely bulging from head, with a small tubercle (preocular tubercle) in front of each; anterior ocellus beneath, not visible from above. Antennæ short, basal segments unusually large. Thorax flat; pronotum extending far down laterad nearly to coxæ; propleurites very small. Legs short. Wings thick, often maculate, or rhomboidal.

Type of genus.—Livia juncorum Latreille. This species was designated as the type by Latreille in 1810 ('10: 265).

SYNOPSIS OF SPECIES.

a^1. Wings maculated, relatively broad.
  b. Wings rather small, rhomboidal or rectangular; M strongly arched; Rs sinuate; vertex short; segment II of antennæ short.........*coloradensis*, new species.
  b^2. Wings rather large, broadly ovate, not squarish; M almost straight; second marginal cell much larger than first.

c^1. Wings rather dark, with subapical whitish band before the apical dark band; veins abundantly spotted with dark brown; first marginal cell mostly clear; vertex broadly and usually deeply emarginate in front; segment II of antennæ more than one-third as long as flagellum.......*maculipennis* Fitch.

c^2. Wings lighter, unicolored to apical brown band; latter lighter than in above species; first marginal cell brown; veins without spots; vertex longer, as in *vernalis*, less emarginate in front; segment II of antennæ less than one-third as long as flagellum....................................*marginata* Patch.

a^2. Wings not maculated, yellowish brown, thick and transversely wrinkled, relatively not so broad.

b^1. Body, with wings, seldom less than 4 mm. in length; vertex large, deeply emarginate in front, protruding to nearly midpoint of second antennal segment, sometimes less, sometimes raised on margins; flagellum of antennæ usually three to four times as long as segment II; forceps of male long, constricted midway and more or less pyriform; forewings thick, nearly opaque..*vernalis* Fitch.

b^2. Length seldom more than 3 mm., often less; vertex smaller, protruding less over antennæ, not deeply emarginate in front, scarcely raised on margins; flagellum of antennæ usually about two and a half times as long as segment II; forceps of male usually short, stout, not pyriform, truncate at apex, more pubescent, especially at apex; forewings thinner, semitransparent.....*caricis*, new species.

LIVIA COLORADENSIS, new species.

Figs. 20, 27, 33, 222, 275, 426.

Length of body 2.4 mm.; length of forewing 2.4; width of head 0.80; length of vertex, 0.55. General color brown to dark brown, darker on abdomen than on thorax and head. Body robust, moderately small.

Head relatively short, not longer than width between eyes; occipital margin but slightly arcuate; vertex coarsely vermiculo-punctate, with a broad, rounded depression on each side of median line, flat anteriorly, only slightly emarginate in front at median line and also over antennal insertions. Eyes less compressed than in *juncorum*, but slightly bulging; ocelli small. Antennæ short, stout; basal segment pedicellate; II not much longer than I; flagellum stout, about three and a half times as long as II; terminal setæ long.

Thorax flat, coarsely punctate, more so on pronotum than on rest of notum. Pronotum about as long as præscutum, sometimes slightly shorter; margin of lateral extremity even with face. Wings subrectangular, about one and a half times as long as broad, rather square apically, coriaceous, conspicuously maculated; apical fourth darkly spotted and maculated, the rest with fewer and more scattered spots; veins with numerous black spots at regular intervals; second marginal cell broad, larger than first.

Genitalia.—*Male.*—Genital segment small, rounded; forceps small, scarcely arched, narrowly acute at apex; anal valve large, long, broad, longer than forceps, square at tip, sides subparallel. *Female.*—Abdomen very stout; genital segment not quite as long as rest of abdomen; dorsal valve longer than ventral, equally acute.

Described from one male and three females from Colorado (C. F. Baker), and one female from Texarkana, Arkansas (E. S. Tucker). This species is apparently related to *maculipennis* Fitch, an eastern species; the wing venation is quite similar, but the size is markedly different. In the characters of the head and thorax the two species are quite distinct.

Type-specimen in author's collection.

LIVIA MACULIPENNIS Fitch.

Figs. 25, 425.

Diraphia maculipennis FITCH '57: 740.—THOMAS '79: 14.
Livia maculipennis RILEY '83: 68.—PATCH '12a: 7.
Livia bifasciata PROVANCHER '86: 307.

Length of body 2.8 mm.; length of forewing 2.9; width of head 0.84. General color brown to dark brown. Body rather large.

Head rather long, about as long as width including only one eye, as broad as prothorax; vertex long, quite deeply emarginate in front at median line, very coarsely vermiculo-punctate, ascending posteriorly and outwardly toward posterior ocelli, front margin rough and broken; eyes very compressed, large. Antennæ relatively longer than in preceding species, second segment very large and long, one-half as long as flagellum; two apical segments black; terminal setæ long.

Pronotum slightly longer than præscutum, somewhat constricted dorsad. Præscutum small. Wings large, coriaceous, maculated, broadly ovate and broadly rounded at apex, about one and two-third times as long as broad; second marginal cell much larger than first; pterostigma large; with a dark band across wing distad, then a light almost hyaline band subapically about as broad as the apical band; basal half yellowish brown except clavus rather hyaline; light portions with conspicuous brown spots situated mostly on veins.

Genitalia.—Male.—Genitalia similar to *coloradensis*. *Female.*—Abdomen large; genital segment about as long as rest of abdomen; dorsal valve longer than ventral, slightly sinuate caudad.

Described from 17 males and females from Washington, District of Columbia (E. A. Schwarz), on "swampy meadows," May, 1880; 7 from Eufaula, Alabama (Schwarz), on Pine; 1 from Holderness, New Hampshire (Hubbard and Schwarz); 12 marked "U.S.D.A., 4783, Sept. 29, 1910;" 2 collected by Uhler (locality unknown); 4 from Hamburg, New York (van Duzee), July; 1 from Pennsylvania (C. F. Baker).

LIVIA MARGINATA Patch.

Livia marginata PATCH 12a:8.

This species is closely related to *maculipennis*, but in a few characters seems to be distinct. The size is about the same. The vertex is longer and bears considerable resemblance to that of *vernalis*, being less broadly emarginate in front; antennal segment II relatively smaller and shorter, less than one-third the length of flagellum. The forewings are similar in shape, but lack the spots on the veins and are lighter colored, with the apical brown band lighter and extending over first marginal cell. The genitalia are similar. The mesonotum is conspicuously darker than in *maculipennis*, appearing as a brown spot on the dorsum.

Described from two females from Holderness, New Hampshire, collected by Hubbard and Schwarz at the same time apparently as the one specimen of *maculipennis* from this same locality. The type locality is Colebrook, Connecticut (H. L. Viereck), one male described by Miss Patch.

LIVIA VERNALIS Fitch.

Figs. 3, 24, 26, 217, 270, 423.

Livia vernalis FITCH **51**:64.—THOMAS **79**:14.—RILEY **83**:68.—PACKARD **90**:803.—LINTNER **93**:404,411.—PATCH **12a**:7.
Diraphia femoralis FITCH **57**:740.—RILEY **83**:68.
Livia femoralis LINTNER **93**:404,411.
Diraphia calamorum FITCH **57**:740.—RILEY **83**:68.
Livia saltatrix PROVANCHER **86**:307.

Length of body 2.8 mm; length of forewing 2.9; width of head 0.81; length of vertex 0.76. General color orange to light brown, sternum and face dark, abdomen lighter; antennæ black at tip. Body large.

Head long, as broad as prothorax; vertex large, sides nearly straight, as long as width including only one eye, rather deeply emarginate in front of median line, margins more or less upturned, produced in front to nearly the middle of segment II of antennæ; postocular portion large and extensive, with an oblique fossal impression across it. Eyes large, scarcely bulging. Antennæ short, II longest and largest, only a little longer than I, one-fourth as long as flagellum; flagellum short, thick, whitish except black tip; terminal setæ long.

Thorax broad, flat, coarsely punctate. Pronotum longer than præscutum, with dorsal foveæ prominent, annulated. Forewings large, very thick and coriaceous, quite opaque, yellowish brown, ovate, about twice as long as broad, broadly rounded at apex; second marginal cell larger than first, relatively broad; Rs scarcely sinuate, rather short; pterostigma long and narrow; clavus very large; distal portion of wing often with a few brownish spots visible only by transmitted light.

Genitalia.—*Male.*—Genital segment large; forceps large, broad at base, narrowed midway and attenuate distad, more or less asymmetrically pyriform, sparsely pubescent; anal valve large, rectangular, sides subparallel, longer than forceps. *Female.*—Genital segment about as long as rest of abdomen; dorsal valve longer than ventral, somewhat sinuate on dorsal margin.

Described from many males and females from the following localities: Agricultural College, Michigan (C. F. Baker); Ames, Iowa (C. W. Mally); New York; Washington, District of Columbia (Hubbard and Schwarz), February, March, June, and November: Maryland, February; Herndon, Virginia, in June.

LIVIA CARICIS, new species.

Figs. 28, 221, 424.

This species is in many respects very similar to *vernalis*. The size is usually distinctly smaller, sometimes very much so. The general color is similar, but often darker, sometimes almost black. The principal differences in structure are as follows: Vertex relatively shorter, usually broadest at front margin of eyes and converging anteriorly thereafter, protruding less over antennæ and protruding portion thicker, less deeply emarginate in front, not raised on margins; second antennal segment relatively longer and larger, flagellum shorter, only about two and a half times as long as II. Forewings thinner, similar in shape, usually less opaque, similar in venation, except M + Cu relatively longer, and Cu_1 shorter and more arcuate.

Genitalia.—Male.—Genital plate small, rounded; forceps small, stout, not pyriform nor constricted as in *vernalis,* truncate at apex, with a slight constriction just below apex, more densely pubescent; anal valve short, only slightly longer than forceps, rectangular. *Female.*—Genitalia similar in general to *vernalis.*

Described from several males and females from Boulder, Colorado, collected by E. Bethel on *Carex,* in July; many males and females from Colorado (no data); Santa Fe, New Mexico (H. S. Barber), May; Lake Tahoe, California, May, 1879; Placer County, California. (A. Koebele), September; Siskiyou County, California (Koebele); Park City, Utah (Hubbard and Schwarz), June; Bear Paw Mountain (Hubbard and Schwarz), September; Oregon (Koebele); Glacier, British Columbia (Hubbard and Schwarz); Northern Illinois; Pen Mar, Pennsylvania (Hubbard and Schwarz); Brunswick, Maine (A. S. Packard).

Type specimen in author's collection.

The differences between this and *vernalis* are somewhat inconstant, except those of the genitalia. The antennal and cephalic characters approach in similarity to such an extent that it sometimes becomes difficult to distinguish the two species on these characters alone. The differences in the male genitalia, however, seem to be constant. Miss Patch (**'12a**:7) mentions the Colorado forms of vernalis as somewhat distinct and gives to them the name of variety *a* of that species.

Most of the western individuals seem to belong to this species, while most of the eastern forms are typical *vernalis*. It is interesting to note, however, that in Pennsylvania and Maine five specimens have been taken which seem to belong to the western species. It is possible that these two species represent only one very variable species which is distributed over the entire country, and varying in the different geographical localities.

The specimens from Placer and Siskiyou Counties are a little smaller and superficially a very little different in appearance, and bear the manuscript name of *Livia subtruncata* Riley. These, however, seem to belong to the species *caricis*.

Tribe APHALARINI.

Genus RHINOCOLA Förster.

This genus is not represented in the American fauna, but it is given a place in this work because of its significance as a connecting form between *Livia* and *Aphalara*. Many of the species described in this genus are not congeneric with the type-species, *R. aceris* Linnæus, and must be referred to other genera.

An examination of *Rhinocola aceris* (figs. 29, 30, 31, 219, 273, 428) will show the many transitional characters which it possesses, intermediate between the two genera above mentioned. The head and dorsum are very slightly arched; the vertex is flat, about as long as broad; the frons and genæ resemble both genera; the antennæ are short and thickened. The pronotum is intermediate between the two genera, extending far down laterad but not as far as in *Livia*, with the pleurites shorter than in *Aphalara*, but of similar form. The wings show some peculiarities of both.

Genus APHALARA Förster.

Notum not strongly arched, often almost flat; head usually scarcely deflexed; vertex flat, more than half as long as broad, lobes somewhat rectangular but rounded in front, making an emargination between them; frons not covered by genæ, but narrow and elongate as in *Livia*, with front ocellus at its anterior end; genæ not swollen into cones, but often roundly swollen on each side of frons; clypeus pyriform, rather large. Antennæ short, never more than twice as long as width of head, often not at all longer than width of head, ten or nine segmented (usually the former).

Pronotum rather long, with two foveæ on each side, and a knob-like lateral termination; pleurites very short, quadrate; pleural suture straight, extending to middle of lateral termination of pronotum; præscutum rather short; scutum large. Hind tibiæ without spur at base, with six to nine black spines at apex; basal tarsus of hind legs with two black, claw-like spines at end, as in *Psylla* and many other genera. Wings elongate-ovate, never acute at apex, often more or less thickened and subopaque or hyaline, often maculated or spotted; M+Cu nearly always as long as R; pterostigma always wanting. Male anal valve always with a long, horizontal, posterior lobe, extending back to forceps.

Type of genus.—*Chermes calthæ* Linnæus. Foerster erected this genus in 1848, and named in it several species but indicated no type species.

The structure of the head resembles rather closely that of *Livia;* the vertex is flat, the frons similar in form, position, and appearance; genæ similar; antennæ short; notum rather flat; pronotum somewhat similar. In the hemispherical eyes, however, the two genera are quite distinct.

Since my treatment of this genus in a previous paper (Crawford **'11b:** 492) a considerable amount of additional material has come to hand, including several new species, and many new records for already described species. Several new species have been added also by Miss Patch (Patch **'11:** 16; **'12b:** 216–219), as well as some life-history records.

This genus presents serious difficulties to the systematist because of the great amount of variation in certain characters which in other genera are more or less constant. Size and color of body, shape of forewing, presence, absence or degree of maculation or coloration of latter, size of genital appendages in both sexes, are all subject to considerable variation within a species, or else there are a very large number of closely related and intergrading species.

The collection of the United States National Museum contains a very large number of specimens of this genus from many localities, and with accompanying notes and data of varying degrees of completeness. These specimens, together with those of the C. F. Baker collection, have been divided into apparent species and arranged in series of variation. In many cases the series are very long, and the variations are so gradual and complex that it is quite impossible to separate species within the series. Until accurate ecological data is available for many of these species we can not be sure of our systematic arrangement. All that can be done at present is to group these series of similar forms into provisional species. Any attempt to subdivide them would result in confusion.

SYNOPSIS OF SPECIES.

a ¹. Antennæ ten-segmented.

b ¹. Clypeus much elongated, more or less cylindrical, rounded or truncate at apex, extending down and forward; notum with four more or less distinct light-colored stripes; female genital segment very short; wings hyaline to fumate, or maculated apically..................................*calthæ* Linnæus.

b^{2}. Clypeus subglobose or pyriform, not elongated, more or less appressed to face.

c^{1}. Forceps of male clavate, with an inwardly directed tooth on inner anterior margin subapically.

d^{1}. Body not very large; length to tip of folded wings distinctly less than 4 mm.

e^{1}. Antennæ not longer than width of head.

f^{1}. Wings clear, with an irregular brown band across apex diagonally; color of body reddish to flavous .... *rumicis* Mally.

f^{2}. Wings whitish, opaque, covered more or less densely with small round brown spots.

g^{1}. Head and thorax not brown or dark colored (see *pinicola*).

h^{1}. Color whitish; length usually about 2 mm to tip of folded wings; wings sparsely dotted .... *artemisiæ* Förster.

h^{2}. Color not whitish.

i^{1}. Female genital segment as long as head and thorax together, with short pubescence; length to tip of folded wings usually over 2.5 mm, often 3.5 mm; color greenish yellow, with whitish stripes on thoracic dorsum; wings elongate, densely spotted .... *angustipennis* Crawford.

i^{2}. Female genital segment shorter, with long hairs on distal half of dorsal valve; length to tip of wings not much over 2 mm; color greenish; wings less densely spotted, less elongate. *viridis*, new species.

g^{2}. Head and thorax brown, or mostly dark colored; wings rather sparsely spotted.

h^{1}. Thorax very strongly arched, broad, variegated with flavous and dark brown (female sometimes mostly flavous). *pinicola*, new species.

h^{2}. Thorax not very strongly arched, narrower; dorsal head and thorax chocolate brown, abdomen and venter flavous. *suaedæ*, new species.

e^{2}. Antennæ distinctly longer than width of head.

f^{1}. Head and thorax greenish yellow or flavous; length to tip of folded wings 3 mm or more; thorax scarcely arched.

g^{1}. Forewings not spotted, somewhat flavous.............. *veaziei* Patch.

g^{2}. Wings indistinctly and sparsely spotted.... *veaziei metzaria* Crawford.

f^{2}. Head and thorax darker; brown or black.

g^{1}. Wings clear or indistinctly spotted in apical portion; male genitalia relatively very large; color brown to black, abdomen flavous. *caudata*, new species.

g^{2}. Wings with an irregular oblique brown band across apex, and spotted more or less besides; male genitalia not large; color light brown to blackish, with lighter markings on thorax..... *pulchella* Crawford.

d^{2}. Body very large, over 4 mm long to tip of folded wings, often over 5 mm; male forceps greatly enlarged at apex; wings very large and broad.

e^{1}. Wings clear or indistinctly browned in apical portion, often with a slight brownish tinge over entire surface.................. *picta* Zetterstedt.

e^{2}. Wings similar, but with a distinct brown transverse band subapically. *fascipennis* Patch.

c^{2}. Male forceps not clavate at apex, without inner subapical tooth; wings maculated.

d^{1}. Posterior process of male anal valve tapering uniformly to apex, not lanceolate; forceps deeply bifurcate, with two long thin processes; antennæ one and a half times width of head .... *alaskensis* Ashmead.

d^{2}. Posterior process of male anal valve conspicuously lanceolate, petiolate at base; forceps T-shaped; antennæ one and a fourth times width of head. *nebulosa kincaidi* Ashmead.

a^2. Antennæ nine-segmented (apparently eight); body small.
Anomocera, new subgenus.

b^1. Forewings whitish, not maculated or spotted; forceps of male serrate on apical margin, with a small inner apical tooth..............*minutissima* Crawford.

b^2. Wings with numerous brown spots; a supernumerary marginal cell often present; forceps with apical margin not serrate; inner subapical tooth on anterior margin..................................*anomala*, new species.

APHALARA CALTHÆ Linnaeus.

FIGS. 106, 161, 165, 170, 171, 377, 380, 382, 500, 504.

Chermes calthæ LINNÆUS '61: sp. 1005.
Aphalara calthæ LOEW '82: 233; '86: 149; '88: 13.—EDWARDS '96: 232.—SULC '06: 1.—OSHANIN '07: 346.—REUTER '81: 149; '08: 65.—KUWAYAMA '08: 154.—CRAWFORD '11b: 495.
A. polygoni FOERSTER '48: 80.—SCOTT '76: 561.—DOUGLAS '79: 255.—LOEW '86: 149.—MALLY '94: pl. 15.—EDWARDS '96: 232.—PATCH '11: 235; '12b: 216.
A. ulicis FOERSTER '48: 96.

Length of body 1.6 to 2.2 mm; length of wing 2.5 to 2.9; width of head 0.75 to 0.80. General color light brown to dark chocolate brown or reddish; vertex usually lighter; mesonotum with four stripes of lighter brown usually present; stripes just mentioned may be variable in degree of distinctness; abdomen darker, more or less variegated; antennæ flavous, black at tip; legs light brown to brown; wings variable in extent of maculation, from a slight fumate condition in apical portion to a more distinct brown maculation or bands; sometimes the entire wing surface is slightly fumate, with veins dark and prominent.

Head not quite as broad as thorax; vertex nearly half as long as broad, with two foveæ of varying depth and extent; genæ somewhat swollen; clypeus unusually enlarged and elongate, projecting forward and downward, cylindrical and truncate. Antennæ seldom longer than width of head (this may vary somewhat, however), rather thick.

Thorax seldom arched strongly, usually rather flat, coarsely punctate. Legs short. Wings variable in size as well as coloration, usually darker in apical half, venation as shown in figure.

Genitalia.—Male.—Anal valve moderately large; posterior lobe long, converging to apex; forceps rather short, slightly enlarged at apex, inner terminal tooth short.—*Female.*—Genital segment usually about as long as preceding ventral sclerite, sometimes longer, variable.

Described from numerous males and females from: Washington, District of Columbia (E. A. Schwarz), May 30, 1884; Massachusetts (no data); Ames, Iowa (C. W. Mally), on *Polygonum sp.*, March 1, 1885; Illinois (no data); Louisiana (C. F. Baker), no data; Wyoming (A. Koebele), June; Ogden, Utah (Koebele), on ?*Artemisia tridentata*, June 17, 1885; Park City, Salt Lake City, American Forks, and Alta, all Utah (Hubbard and Schwarz), June 15 to 30; Cañon City, Colorado (J. Gravenstock), on "cultivated tomatoes," October 15, 1884; Glenwood, Colorado (C. P. Gillette), no data; (Mesilla, New Mexico (Cockerell), August 3; Santa Fe, New Mexico (H. S. Barber), May 6; Placer County, California (Koebele), September; Alameda, California (Koebele), August 1, 1885; San Mateo, California (Baker), no data; Castle Rock, Nevada County, California (Koebele), September (doubtful specimens); Claremont, California (Baker); Oregon (Baker), no data; Washington (C. P. Gillette), no data; Acapulco, Mexico (Baker); Havana, Cuba (Baker). The distribution is wide, also, throughout Europe, many localities in Asia; Japan (Kuwayama).

The food plants are several and varied: *Polygonum*, several species; *Caltha palustris; Artemisia tridentata;* probably others, also.

It is quite possible that there are several closely related species in this large series of specimens before me, but with the present inadequate biological data it is impossible to separate them. For the present, at least, the name *calthae* will be applied to all. The variations in color, markings, size, relative proportions of parts, size of genitalia, etc., are so numerous and gradual and intergrade to such an extent that it is impossible to recognize two or three species without being required to recognize a dozen.

Aphalara polygoni of Förster was said by Loew (**'82**:233), to be identical with *calthæ*. Mally's *polygoni*, notwithstanding Miss Patch's statements, seems to differ from *calthæ* no more than do many other slight variants. For the present, therefore, it seems reasonable to continue to recognize the two species as identical, *polygoni* being a synonym ot *calthæ*. This conclusion is based on the examination of several of Mally's specimens and several of those studied by Miss Patch, as well as several European specimens of both species.

A. nubifera Patch (**'12b**:216) is very close to *calthæ* and is really not more distinct than many variants of the species. However, until more certain disposal of this variable specific group can be made, *nubifera* will not be merged into *calthæ*. In the one paratype which Miss Patch has kindly loaned to me practically the only difference there is between the two species is in the longer genital segment of the female of *nubifera*, and this character is subject to some variation in *calthæ*.

Aphalara exilis Weber and Mohr was referred (Crawford **'11b:** 496) to *calthæ*, with some uncertainty. Since then I have examined several additional specimens of that European species, as determined by Melichar and Reuter, and the identity of the two species seems more certain. However, since *exilis* has not been reported from America we need not concern ourselves with it at present.

APHALARA RUMICIS Mally.

Figs. 164, 384, 501.

Aphalara exilis rumicis Mally '94:166.
A. rumicis Patch '12b:217.
A. calthæ maculipennis Crawford '11b:496.

Very similar to *calthæ*, differing chiefly in having the clypeus shorter, subglobose or pyriform as in most species, and not projecting downward. Male forceps with a tooth on anterior inner margin much farther from apex than in *calthæ*. Wings usually more decidedly colored than in *calthæ*, pattern similar.

Described from several specimens of both sexes from Ames, Iowa (C. W. Mally), on *Rumex altissimus*, March, 1895; several from St. Louis, Missouri (J. T. Monell), on *Rumex* sp., September 22, 1911 (loaned by Miss Patch). In this species are placed also for the present at least other specimens from Evanston, Wyoming (Koebele), June 15, 1885; Hood River, Oregon (Hubbard and Schwarz), May 25; Placer County, California (Koebele), Sept.; Scotia, California (H. S. Barber), May 20; Boulder, Colorado (E. Bethel), on *Sophia pinnata;* Plano, Texas (E. S. Tucker), "in corn field," June, 1907.

These latter specimens were named *A. calthæ maculipennis* Loew in a former paper (Crawford **11b**:496), and it is possible that all of these mentioned under *rumicis* belong to Loew's species. No good specimens of the latter, however, are available for comparison, and until they are it will create less confusion to designate our American forms as *rumicis*, instead of by the European name.

APHALARA ARTEMISIÆ Förster.

Aphalara artemisiæ Förster '48:96.—Scott '76:67; '77:283.—Reuter '81:152.—Loew '82:232; '88:12.—Sulc '06:1.—Edwards '08:86; (not '96:232).—Kuwayama '08:154.—Crawford '11b:496.
Psylla malachitica Dahlbaum '50:177.

Length of body (male) 1.3 to 1.5 mm; (female) 1.7; length to tip of folded wings usually about 2. General color whitish to very pale flavous; wings spotted. Body small.

Vertex slightly more than half as long as broad, with a large shallow depression on each side of median line; clypeus pyriform. Antennæ about as long as width of head or shorter. Thorax not strongly arched, coarsely punctate. Legs short. Wings small, not over two and a half times as long as broad, covered sparsely with small round brown spots; membrane somewhat thickened, divided by a series of fine dots into numerous cell-like divisions (visible only under high magnification), each brown spot covering one of these.

Genitalia.—Male.—Anal valve relatively rather small; forceps somewhat enlarged at apex, with a small tooth on inner anterior side subapically. *Female.*—Genital segment large, longer than rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from American Forks, Utah (Hubbard and Schwarz), June 24; Colorado (no data); one male from Pernitz, Austria (determined by Franz Loew). Edward's *artemisiæ* (**'96**:232) is a totally different species, named by Oshanin (**'07**:344) *pilosa*.

Closely related to this species is a long series of forms which show more or less pronounced differences and many close similarities. Some of these, though not all, have been separated off and assigned to distinct species.

APHALARA ANGUSTIPENNIS Crawford.

Figs. 162, 378, 502, 503.

A. artemisiæ angustipennis CRAWFORD '11b:499.—PATCH '12b:218.

Similar to *artemisiæ*, differing as follows: Size usually larger, sometimes much larger; length to tip of folded wings varying from 2.3 to 3.5 mm. Color flavous; scutellum with several more or less distinct whitish stripes; antennæ black at tip. Wings relatively narrower and longer, usually nearly three times as long as broad, more densely covered with similar brown spots which are often crowded together so closely that they run together and form more extensive maculæ. Genitalia similar, but larger.

Described from numerous specimens from many localities: Claremont and Berkeley, California (Crawford), on *Artemisia californica*, June to September; Los Angeles, California (Coquillett), no data; Hood River, Oregon (A. Koebele), May 21; Easton, Washington (Koebele); Wasatch Mountains, Utah (Hubbard and Schwarz), June 20, 1885; Colorado (Gillette), no data; Black Hills, South Dakota (J. L. Webb), July 11; Oakland, Maryland (Hubbard and Schwarz), July 10. Some of these bear the manuscript name of *Aphalara angustipennis* Riley, and others *A. utahensis* Riley, but some of the latter seem to belong to *artemisiæ*, as described above.

Type-specimen in author's collection.

APHALARA VIRIDIS, new species.

Color greenish or greenish yellow throughout; wings rather sparsely covered with small, round, brown spots, as in *artemisiæ*, membrane thick and whitish. Female genital segment distinctly shorter than in *artemisiæ*, and with long hairs on dorsal side of dorsal valve caudad, instead of the short pubescence characteristic of the related species. Male genitalia similar to *artemisiæ*.

More closely related to *artemisiæ* than to *angustipennis*, being similar in size and general proportions to the former.

Described from several males and females from Sulphur Springs Valley, Arizona (Hubbard) May.

Type.—Cat. No. 18065, U. S. Nat. Mus.

APHALARA PINICOLA, new species.

Close to *artemisiæ*, but body much more robust; thorax broader and much more strongly arched; head narrower than thorax. Color blackish and flavous; vertex black in center of each lobe; pronotum and scutum with alternating stripes of black and flavous; præscutum black cephalad; abdomen mostly dark, variegated somewhat with flavous; antennæ black at tip. One female in the lot is mostly flavous, with much of the black faded or wanting. Wings shaped as in *artemisiæ*, sparsely spotted. Genitalia rather similar.

Described from four males and females from Argus Mountains, California (Koebele), on *Pinus monophylla*, May, 1891.

Type.—Cat. No. 18066, U. S. Nat. Mus.

APHALARA SUAEDÆ, new species.

Fig. 110.

Close to *artemisiæ*, differing as follows: Color of vertex and thoracic dorsum reddish brown to chocolate brown, abdomen, venter, legs, and antennæ light yellow. Thorax rather flat, not arched as in *pinicola*, and rather narrow, finely punctate. Vertex relatively larger. Wings narrower in apical portion, more densely spotted. Genitalia similar.

Described from several males and females from Death Valley, California (Koebele), April, 1891; Las Cruces, New Mexico (Cockerell), on *Suaeda hiemalis*, November 13, 1893; several in National Museum collection with data "4395," and no more, these bear the *nomen nudum*, *A. suedæ* Riley).

Type.—Cat. No. 18067, U. S. Nat. Mus.

APHALARA VEAZIEI Patch.

Figs. 18, 163, 172, 386, 505.

A. veaziei PATCH '11:16.
A. communis CRAWFORD '11b:499.—PATCH '12b:218.

Length of body 2 to 2.7 mm.; length of forewing 2.7 to 3.1: width of head 0.80 to 0.87 m. General color greenish yellow Body variable from rather small to large, but not as large as *picta*.

Head moderately broad, not quite as broad as thorax, not deflexed; vertex a little more than half as long as broad, with two shallow foveal depressions; clypeus pyriform. Antennæ longer than width of head, some times as much as one and a half times as long.

Thorax almost flat, less arched than usual, finely punctate. Legs moderately long. Wings about two and three-fourths times as long as broad, clear or slightly flavous, more or less transparent, rarely with faint indications of spotting; venation typical.

Genitalia.—*Male.*—Anal valve of usual form, rather large; forceps somewhat similar to those of *artemisiæ*, but more enlarged at apex, with subapical inner tooth larger and more prominent. *Female.*—Genital segment large, longer than rest of abdomen, or as long, dorsal valve longer than ventral and less acute.

Described from numerous specimens from the following localities: Washington, District of Columbia (E. A. Schwarz), May 11, July; Virginia, May 15, 1881 (cabinet name, *Aphalara solidaginis* Riley); Oakland, Maryland (Hubbard and Schwarz), July 10; Fort Pendleton, West Virginia (Hubbard and Schwarz), July 10; Dows Lake, Ottawa, Ontario, Canada (W. Metcalfe), May 27, 1903; Nebraska (Bruner), no data; Black Hills, South Dakota (J. L. Weber), June 24; Polk County, Wisconsin (C. F. Baker); Banner, Wyoming (C. W. Metz), August, 1910; American Forks, Utah (Hubbard and Schwarz), June 22; Easton, Washington (Koebele); Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); Flagstaff, Arizona (Barber and Schwarz), "4–7;" Pagosa Springs, Colorado (Baker).

This is another very variable and widely distributed species, and one as difficult to define as *calthæ* and *artemisiæ*. The variations in size of body, size and shape of forewing, length of female genital segment, and minor variations in wing venation may represent several closely allied species, or one variable and elastic species. If the former is true it is impossible to attempt to separate the species with our limited ecological data.

The description of *A. communis* Crawford was in press when Miss Patch's description of *veaziei* appeared. A comparison of a paratype of her species with *communis* shows that the two are identical, so far at least as we are able to determine now.

The structure of the male forceps is not very distinctive of this species. The same type of forceps is possessed by *A. picta*, and other species also.

APHALARA VEAZIEI METZARIA Crawford.

A. communis metzaria CRAWFORD '11b: 499.

This varietal name was given to several individuals with the wings spotted more or less indistinctly (never darkly) in the apical portion. It is possible that this character is not of varietal value, but for the present it may remain.

Described from several males and females from Sheridan, Wyoming (C. W. Metz); Pagosa Springs, Colorado (C. F. Baker); Los Angeles, California (Koebele); Beeville, Texas (Hubbard and Schwarz), on *Aster*, November.

Type in author's collection.

APHALARA CAUDATA, new species.

Resembling *suaedæ* in color and size; head similar, but antennæ distinctly longer than width of head. Vertex and thoracic dorsum strigate. Wings usually clear, sometimes indistinctly spotted, not thickened and marked, as in *artemisiæ*, but similar in shape and size to the latter. Male genitalia relatively very large; forceps as in *veaziei*, with a large, clavate apex, and a rather large subapical inner tooth.

Described from seven males and females from Los Angeles, California (Koebele), March. These bear the manuscript name of *A. koebelei* Riley.

Type.—No. 18068, U. S. Nat. Mus.

APHALARA PULCHELLA Crawford.

Figs. 107, 168, 176, 379, 499.

A. pulchella CRAWFORD '11b: 500.

Length of body 1.7 to 2.2 mm.; length of forewing 2 to 2.4; length to tip of folded wings 2.3 to 3. General color brown, variegated with flavous; scutum more or less striped with flavous; antennæ pale, black at tip, and sometimes on tip of each segment.

Head not as broad as thorax; vertex conspicuously emarginate on front margin, coarsely strigate; antennæ about one and a half times as long as width of head, slender. Thorax rather strongly arched, broader than in *caudata*, strigate. Legs slender. Wings rather narrow, more attenuate at base than usual, broad distally, almost half as broad as long, clear and semitransparent except on the brown maculæ; wing picture as in figure.

Genitalia.—*Male.*—Genitalia rather large; anal valve of usual form for this genus; forceps as in *caudata*, enlarged at apex. *Female.*—Genital segment as in *veaziei*, longer than rest of abdomen, rather slender, acute at apex.

Described from several males and females from California, as follows: Claremont (C. F. Baker); San Mateo County (Baker); Los Angeles (Coquillett). The latter bear the manuscript name of *A. coquilletti* Riley.

Type in author's collection.

APHALARA PICTA Zetterstedt.

Figs. 166, 173, 383, 506.

Chermes picta ZETTERSTEDT '40: 308.

Aphalara picta FLOR '61: 539.—SCOTT '76: 563.—LOEW '76: pl. 2, figs. 36–40; '77: 124; '79: 562; '82: 256; '86: 150; '88: 13.—REUTER '81: 151.—EDWARDS '96: 230.—SULC '06: 2.—OSHANIN '07: 347.—CRAWFORD '11b: 501.—PATCH '12b: 217.

A. flavipennis FOERSTER '48: 89.
A. sonchi FOERSTER '48: 96.
A. alpigena MAYER-DÜR '71: 402.
A. nervosa THOMSON, Opusc. Ent. '08: 840.

Length of body about 3.3 mm.; length to tip of folded wings 4.5 to 5.2; length of wing 4 to 4.3; width of head 0.95 to 1. General color flavous to brown; thoracic dorsum often more or less distinctly striped; abdomen darker; wings usually flavous; antennæ flavous, black at tips. Body very large.

Head much narrower than thorax; vertex more than half as long as broad, rather deeply emarginate in front at median line, coarsely punctate; antennæ a little longer than width of head.

Thorax very large, broad and strongly arched, coarsely punctate. Legs thick and stout. Wings large, broad, almost half as broad as long, more or less flavous, sometimes brownish in apical third with faint markings, somewhat transparent; first marginal cell large.

Genitalia.—*Male.*—Genitalia large; anal valve of usual shape, with the inferior process of the posterior lobe larger than usual; pubescence stiff; forceps very large, with a large, clavate apex and an inner subapical tooth. *Female.*—Genital segment almost or fully as long as rest of abdomen, thick at base, subacute; dorsal valve longer than ventral; pubescence stiff and prominent.

Described from several males and females from Colorado (Baker), no data; St. Louis, Missouri, May 5, 1878. Two manuscript names have been applied to these: *A. harrissii* Riley and *A. leucanthemi* (?) Fitch. These have been compared with four females from Aaken, Germany (determined by F. Loew).

The large size of the body easily distinguishes this and the following species from other American species of this genus. Some individuals, however, are smaller, not much larger than the largest of *veaziei*, but differ in having the male forceps relatively larger, the female genital segment relatively stouter, the wings more flavous, the thorax broader and more strongly arched, and the antennæ relatively shorter.

APHALARA FASCIPENNIS Patch.

A. fascipennis PATCH '12b:217.

This species is very closely related to *picta*, resembling it in size, shape, and structure of body, including the genital appendages. The chief difference is in the maculation of the forewing. A brown irregular band crosses the wing near the apex. This is a rather doubtful specific character in this genus, if we may judge from several other species previously described, but the fact that the fuscous-winged forms have been found thus far mostly in the western portion of the country, while the maculate-winged forms seem to be limited to the Northeast, seem to indicate that they may be distinct species but closely related.

The characters of the male genitalia have been taken from Miss Patch's description, since only female specimens are before me. This description has been based on four females, two from Bretton Woods, New Hampshire (van Duzee), June 30, 1909; and two from Massachusetts (Philip Uhler), bearing Harris's manuscript name of *Psylla pallida.* Miss Patch gives as localities: Ottawa, Ontario, Canada, and Tompkins County, New York.

APHALARA ALASKENSIS Ashmead.

Figs. 109, 111, 112, 132, 403.

Aphalara alaskensis ASHMEAD '10:136.

Length of body (male) 2.1 mm; length of forewing 3; width of head 0.78. General color dark brown to black, sometimes flavous (perhaps immature adults); vertex glossy black, smooth; thoracic dorsum mostly black, strigate; pronotum yellow on hind margin; pleuræ around wing bases and connexiva of abdominal segments flavous; tibiæ, basal tarsus, antennæ except tip, yellow; wings maculated brown, picture as in figure. In the two paratypes of this species from Fox Point, Alaska, the color is nearly uniformly flavous with indications of brownish markings, and the wings are indistinctly maculated, as described above. It is possible that the darker individuals represent a varietal form of the species, but it seems most probable that the Alaskan individuals were not yet fully colored.

Head large, fully as broad as thorax, scarcely deflexed; vertex very broad, smooth, glossy, broadly depressed discally on each side of median line, less emarginate over front ocellus than in *pulchella;* genæ and clypeus small; eyes very large and prominent. Antennæ very long relatively, nearly twice as long as width of head, slender.

Thorax long, somewhat arched, strigate on dorsum. Legs long, slender, especially the front pair. Wings hyaline, transparent except on the maculæ, nearly two and a half times as long as broad, broadly rounded at apex; marginal cells large, subequal.

Genitalia.—*Male.*—Genitalia large; forceps large, bilobate, pubescent; basal portion short and narrow, dividing into two long processes; posterior process long, arcuate, acuminate, subacute at tip: anterior process shorter, narrower, less acute, extending inward. Anal valve long, with posterior lobes long and rather large.

Described from six males, two from Fox Point, Alaska (paratypes), July, 1899, collected by Harriman-Alaska Expedition; one from Easton, Washington (Koebele); and three from Colorado (C. P. Gillette), no data.

One female of *A. schwarzii* (a paratype), from Popoff Island, Alaska (Harriman-Alaska Expedition) is colored very similarly to the darker forms of *alaskensis*. Ashmead's figure of the male genitalia of *schwarzii* is practically meaningless, and therefore I am unable to state with certainty whether or not these two species are identical. It seems probable, however, that they are at least closely related.

APHALARA NEBULOSA KINCAIDI Ashmead.

Figs. 167, 174, 175, 508.

Aphalara kincaidi Ashmead '10: 136.
A. nebulosa americana Crawford '11b: 503.—Patch '12b: 219.

Length of body (male) 1.8 mm; (female) 2.2; length of forewing 2.2 to 2.4; width of head 0.82. General color brown to blackish, with flavous markings on vertex and thoracic dorsum; wings transparent, maculated brown in apical half, as shown in figure; legs pale brown; antennæ flavous, black distally.

Head almost as broad as thorax, not deflexed; vertex large, almost flat, resembling *alaskensis*, but more emarginate in front; antennæ about one and a half times as long as width of head; clypeus smaller than in European *nebulosa* and more posterior. Thorax rather flat, not very broad, strigate. Wings about two and a half times as long as broad, rather transparent, maculated, venation as usual in genus.

Genitalia.—*Male.*—Posterior lobe of anal valve not as in other species of genus, but conspicuously lanceolate with a petiolate base, and a ridged "midrib" in basal portion; forceps moderately long, constricted subapically, and apex abruptly broadened out, T-shaped, with anterior part of apex longer than posterior. *Female.*—Genital segment rather long, but not as long as rest of abdomen; dorsal valve longer than ventral.

Described from one male (paratype of *A. kincaidi*), from Popoff Island, Alaska, July 9, 1899, collected by the Harriman-Alaska Expedition; many males and females from Easton, Washington (Koebele); Fieldbrook, California (H. S. Barber), May 19, 1903; Colorado (no data). Manuscript name: *Aphalara epilobii* Riley.

The American variety differs from the European form as follows: Clypeus smaller and situated farther back; male forceps larger, with apical transverse part almost as long as vertical portion, while in the other it is only a little over half as long; wing picture lighter in color.

ANOMOCERA, new subgenus.

Although a reduction in the number of antennal segments in Psyllidæ is apparently a striking character, judging from the small number of species which show this character, yet this alone may not warrant the erection of a new genus. Two species of *Aphalara* with the antennal segments distinctly reduced are so similar to other species of the genus in nearly every other respect that it seems advisable to regard them as forming a subgeneric group within the genus *Aphalara*. Because of this antennal reduction the name *Anomocera* is given to the subgenus.

The antennæ are short, but not unusually so. The reduction seems to have occurred in the apical segments. The two basal segments are normally enlarged; the third is longest and the succeeding segments subequal to each other. What appears to be the terminal, (eighth) segment is really composed of two short closely connate segments, thus making the antennæ nine-segmented, but apparently only eight-segmented. Other characters are more or less similar to the *holocerous* species.

Type of subgenus.—*Aphalara* (*Anomocera*) *minutissima* Crawford.

APHALARA (ANOMOCERA) MINUTISSIMA Crawford.

Figs. 169, 177, 381, 507.

Aphalara minutissima CRAWFORD '11b: 500.

Similar in size and general gross appearance to *artemisiæ*, differing as follows: Color a little more whitish; wings white, not spotted; antennæ of about the same relative length but only nine-segmented, with the terminal two segments so closely connate that they appear as one segment except by close examination. Thorax usually less arched, coarsely punctate. Wings more narrowed apically, thick, whitish, not spotted or maculated, venation as usual for genus; sometimes slightly brownish toward apex.

Genitalia.—*Male.*—Genitalia similar, but forceps more enlarged at apex, more as in *caudata*. *Female.*—Genital segment relatively very large, almost as large as rest of abdomen and thorax combined, dorsal valve longer than ventral.

Described from numerous males and females from Claremont, California (Crawford), on *Artemisia californica*, April, 1912; Los Angeles, California (Koebele), on same host, April 23, 1886; Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); American Forks, Utah (Hubbard and Schwarz), June 22; Ogden, Utah (Koebele), on "sage," June 20, 1885; and on *Artemisia tridentata*, June 13, 1885; one female from Nebraska on *Artemisia tridentata*.

Manuscript name: *A. occidentalis* Riley.

Type in author's collection.

APHALARA (ANOMOCERA) ANOMALA, new species.

This species is somewhat similar in general proportions to *minutissima*, but a little larger and a little more robust. Antennæ short, a little longer and more slender than in *minutissima;* III relatively shorter; IX very short, indistinct, comprising only a short apical portion of VIII-IX. Forewings small, whitish, wrinkled, covered with numerous small round, brown spots, as in *artemisiæ.* In both forewings of all three specimens at hand (both sexes) there is a remarkable anomalous venational character; Cu^1 and M^3 unite and send a common vein to the margin, thus making a supernumerary cell. The uniformity of these veins in both forewings of several specimens is a remarkable anomaly. Additional material is necessary, however, to ascertain the general prevalence of this character.

Male genitalia somewhat similar in general type to those of *artemisiæ;* forceps with a small inner subapical tooth, not serrate on apical margin, as in *minutissima.* Female genitalia, as in *artemisiæ.*

Described from two females from Sacramento, California (Koebele), June 28, 1885, and one from Folsom, California (Koebele). No other specimens from either of these localities are available. These bear the manuscript name of *A. occidentalis anomala* Riley. *A. occidentalis* was a manuscript name for *minutissima.*

Type.—Cat. No. 18069, U. S. Nat. Mus.

APHALAROIDA, new genus.

Head resembling somewhat that of *Aphalara,* but shorter, slightly less flattened, somewhat rounded down in front, but much less so than in *Heteropsylla;* genæ somewhat swollen beneath, never conical, not covering frons; frons similar to *Aphalara,* but much shorter. Antennæ very short. Thorax only slightly arched; pronotum terminating laterad in a knob-like swelling, with the pleural suture extending to the midpoint of this as in *Aphalara.* Wings small, thickened, opaque, or semiopaque, often maculated, with a pterostigma. Anal valve of male simple, not as in *Aphalara.* Body surface often covered with glandular hairs.

Type of genus.—Aphalaroida pithecolobia, new species.

This is a very homogeneous and interesting little group of species, distributed over southwestern and southern United States. There is a remarkable similarity throughout the genus in structural characters, the species differing chiefly in size, amount of glandular pubescence and in markings of body and wings. There is some data to show that summer and winter forms of the same species differ in color and markings to some extent. The species are so similar that only a brief description of all but the type is given herewith.

SYNOPSIS OF SPECIES.

a^1. Head, thorax, and sometimes wings covered more or less densely with white glandular hairs.
  b^1. Forewings not maculated, almost or quite uniform in color; hairs not dense on body, often wanting on wings.......................*pithecolobia*, new species.
  b^2. Forewings maculated, not uniform in color.
    c^1. Body large, more than 2.5 mm to tip of folded wings; forewings brown and white; body and wings covered very densely with long white hairs (some times shorter and more sparse, or almost wanting in a few specimens); dorsum brown with orange stripes and bands.........*spinifera*, new species.
    c^2. Body smaller, less than 2 mm to tip of wings; body and usually the wings covered more or less densely with short white hairs; color dark; wings white, with brown maculæ; dorsum uniform brown to black.*prosopis*, new species.
a^2. Body and wings without glandular hairs, or if present, very short and inconspicuous; body medium to small.
  b^1. Forewings brown, with numerous small white spots scattered over surface ....*inermis*, new species.
  b^2. Forewings white, with a broad, crescentic, brown macula on apical and posterior margin, often extending into primary furcation of M+Cu. *Winter form:* Wings brown, with the same macula black..............*acaciæ*, new species.

APHALAROIDA PITHECOLOBIA, new species.

Figs. 59, 239, 284, 449.

Length of body 1.4 mm.; length of forewing 1.7; width of head 0.70. General color whitish to very light brown. Body small, finely pubescent. In all the specimens before me the hairs have collected particles of the fine waxy excrement.

Head not deflexed, not as broad as thorax, punctate; posterior margin arcuate; vertex discally rather plane, with a small foveal impression on each side of median line, scarcely elevated on post-ocellar regions, rounded downward in front, with anterior ocellus beneath. Antennal insertions large, lateral, in front of eyes; genæ and subantennal regions somewhat swollen. Eyes small. Antennæ not longer than width of head, slender.

Thorax broad, coarsely punctate. Pronotum flat, with lateral "knob" small; pleurites short; dorsum finely pubescent. Wings small, slightly rhomboidal, coriaceous, white to light brown, deeply wrinkled, granulate; about two and a fourth times as long as broad, somewhat rounded at apex; first marginal cell larger than second; pterostigma long and conspicuous; claval suture prominent; veins set biseriately with conspicuous setæ, similar in appearance to those on dorsum and vertex.

Genitalia.—Male.—Genitalia relatively not very small; forceps large, short, broad, subspatulate; anal valve very long and slender, simple, square at tip. *Female.*—Genital segment short, broad, acute at apex; valves of equal length; pubescence quite dense.

Described from 14 males and females collected by E. A. Schwarz at Devil's River, Texas, on *Pithecolobium.*

Type in author's collection.

APHALAROIDA SPINIFERA, new species.

Fig. 399.

Length of body 1.7 mm.; length of forewing 2. General color brown, with orange markings, sometimes more uniformly orange to yellowish (probably immature forms); vertex orange on lateral half of each lobe; pronotum and præscutum orange on posterior portion; scutum orange on median dorsal line and around wing bases, and a narrow arcuate line halfway between these; venter dark; forewings whitish, with irregular brown maculæ, usually as represented in figure, sometimes less maculated; some forms are lighter with only a few small scattered maculæ on the wings.

Head, thorax, wings, legs, and abdomen (to a less extent) densely, often very densely, covered with long white hairs which are usually clavate because of the excretions on them; sometimes the hairs are fewer or even almost wanting in rare instances. Head distinctly narrower than thorax, deflexed somewhat, similar in general to type species; antennæ one and a half times as long as width of head. Thorax long, rather broad. Wings over two and a half times as long as broad, coriaceous, maculated, rhomboidal, apex at termination of radial sector; first marginal cell larger than second.

Genitalia.—*Male.*—Resemble type species; forceps stout, about twice as long as broad, oval; anal valve nearly twice as long as forceps, converging a little toward apex. *Female.*—Genital segment stout, shorter than rest of abdomen, subacute at apex.

Described from 30 males and females from Tucson, Arizona (H. G. Hubbard), on *Prosopis juliflor*, in December and January; 7 from Palm Springs, California (Hubbard), on *Phoradendron*, growing on *Acacia gregii;* 16 from Argus and Panamint Mountains, California (Koebele), April. All in the collection of the United States National Museum. The Arizona specimens bear the label *Rhinocola spinifera*, a manuscript name; the California forms are labeled *Rhinocola rauca*, but are apparently the same species.

Type.—Cat. No. 18070, U. S. Nat. Mus.

APHALAROIDA PROSOPIS, new species.

Fig. 404.

Length of body 1.7 mm.; length of forewing 1.5. General color dark brown to black uniformly; forewings maculated with dark brown, as in figure. Body small. Glandular hairs dense, but short, on head, thorax, and wings and sometimes the legs.

Head narrower than thorax, deflexed; antennæ a little longer than width of head. Eyes small. Thorax arched somewhat; pronotum moderately long; meso-episternum prominently bulging between fore and middle coxæ. Forewings small, coriaceous, rhomboidal slightly, with apex between radial sector and medial branch, less than two and a half times as long as broad, very slightly transparent on white portions, granulate; marginal cells subequal; pterostigma long.

Genitalia.—*Male.*—Genitalia similar to type-species; relatively small; forceps narrower than in *spinifera;* anal valve not much longer than forceps. *Female.*—Genitalia similar to type species.

Described from 10 males and females collected at Tucson, Arizona, by H. G. Hubbard, in January, on *Prosopis juliflor,* and 15 on "Larrea," on December 13, 1896, at the same place. These specimens were labeled *Rhinocola prosopis* (manuscript).

Type.—Cat. No. 18071, U. S. Nat. Mus.

APHALAROIDA INERMIS, new species.

Fig. 398.

Length of body 1.7 mm.; length of forewing 1.8. General color light chocolate brown over most of body surface, including legs; vertex often lighter; thoracic markings as in *spinifera;* wings light brown, with small, irregular white spots, which are sometimes rather large. Body small to medium in size, without conspicuous glandular hairs except in front of vertex and in front of wing bases, very small.

Head almost as broad as thorax, relatively large; vertex rather long, more or less rectangular. Antennæ a little longer than width of head. Thorax as in related species. Forewings nearly two and a half times as long as broad, rather thick, coriaceous, somewhat rhomboidal; pterostigmal vein (R) incomplete; marginal cells subequal. Genitalia of both sexes similar to *prosopis.*

Described from many males and females from Tucson and Fort Yuma, Arizona (Hubbard), December and January, on *Prosopis juliflor;* Palm Springs, California (Hubbard), February; one female from San Antonio, Texas (E. A. Schwarz), on *Mimosa borealis,* in May.

Type.—Cat. No. 18072, U. S. Nat. Mus.

APHALAROIDA ACACIAE, new species.

Fig. 397.

Length of body 1.7 mm.; length of forewing 1.7. General color brown; vertex light brown; thoracic dorsum marked as in *spinifera* but much more indistinctly so; forewings (summer form) largely whitish with a brown to dark brown macula as in illustration; (winter form): Darker on body; wings darker, with macula black. Body and wings without glandular hairs, or with extremely short ones; usually almost glabrous. Body small to medium in size.

Head narrower than thorax; relatively smaller than in *inermis;* antennæ about as long as width of head, light colored. Thorax of typical form. Wings slightly rhomboidal, thickened, granulate, less than two and a half times as long as broad; pterostigma long; marginal cells subequal.

Genitalia.—Male and female genitalia similar to type-species.

Described from 17 males and females from San Diego, Texas (E. A. Schwarz), on *Acacia amentacea*, May, October, and December; 1 female from Palm Springs, California (Hubbard), on *Phorodendron* growing on *Acacia gregii*, February.

Type.—No. 18073, U. S. Nat. Mus.

Subfamily PAUROPSYLLINÆ.

The chief characteristics of this subfamily are the rounded head and the usually visible frons. Head short, uniformly rounded forward and down, with the frons usually not concealed by the genæ and the genæ variously swollen (conical in *Calophya*). Wings hyaline, ovate; pterostigma usually large and long; first marginal cell often enlarged, or long and narrow.

The typical genus, *Pauropsylla*, is not represented in the American fauna. For a description of this genus see Rübsaamen **'99**: 263; Kieffer **'05**: 167; or Crawford **'12c**: 429.

SYNOPSIS OF GENERA.

a^1. Genæ more or less swollen, but not produced into conical processes; frons always visible; first marginal cell not unusually large.
  b^1. Frons, genæ and vertex forming a relatively smooth surface, frons not as in following genus; head uniformly rounded forward and down; antennæ not very long .... *Paurocephala* Crawford
  b^2. Frons forming the bottom of a groove between genæ, with genæ protruding below frons; head less uniformly rounded down in front; antennæ very long and slender .... *Heteropsylla*, new genus
a^2. Genæ produced into two short or longer conical processes, with the frons sometimes covered; head rounded downward as in the first genus; first marginal cell very much larger than second; antennæ short .... *Calophya* Loew

Genus PAUROCEPHALA Crawford.[1]

Body robust, surface strigate; thorax strongly arched. Head strongly deflexed, rounded downward in front, presenting a roundly convex surface in dorsal view; frons not covered by genæ, visible as a small sclerite forming an uninterruptedly smooth surface with vertex and genæ; genæ not conical, though often swollen. Eyes large. Antennæ longer than width of head. Wings hyaline, more or less oval in shape, with a pterostigma.

Type of genus.—*P. psylloptera* Crawford (a Philippine species).

PAUROCEPHALA MAGNIFRONS, new species.

Figs. 16, 73, 296, 461.

Length of body, 2.6 mm.; length of forewing 3.5; width of head 1. General color greenish yellow throughout.

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[1] The first description of this genus is being published in the Philippine Journal of Science, Vol. 8, No. 4, sec. D, p. 293, Aug. 1813.

Head broad, but not as broad as thorax, very uniformly rounded downward in front; vertex rather large, converging toward front; frons unusually large, a heptagonal sclerite visible from in front, broadest at ocellus, continuing uniformly the surface of vertex and genæ; genæ large, swollen lobately on each side beneath antennal bases, with a long hair at lowermost point; clypeus rather large; (antennæ broken).

Thorax well arched, coarsely punctate or strigate; pronotum long. Hind tibiæ with a spur at base. Wings long, hyaline, transparent, about two and two-thirds times as long as broad, narrowed toward apex, rounded at tip; first marginal cell broader than in *ilicis;* pterostigma long, broad at base.

Genitalia.—Female—Genital segment about half as long as rest of abdomen, acute; dorsal valve a little longer than ventral, with a tuft of hairs dorsad.

Described from one female from Escuintla, Chiapas, Mexico (Crawford), July 25, 1910.

Type in author's collection.

PAUROCEPHALA ILICIS Ashmead.

Figs. 102, 103, 104, 105, 108, 410.

Psylla ilicis ASHMEAD '81: 225.
Aphalara ilicis RILEY '83: 69.
N. B.—*Psyllopa ilicis* CRAWFORD '11c: 632 is a different insect.

Length of body 2 mm.; length of forewing 2.6; width of head 0.93. General color flavous; antennæ brown.

Head uniformly rounded down and forward as in *magnifrons;* frons smaller, similar in position; genæ less swollen, making head appear more as a longitudinal portion of a cylinder. Antennæ about twice as long as width of head, not very slender. Clypeus large, conical, perpendicular. Thorax moderately broad. Propleurites rather large, with pleural suture oblique. Legs rather short; hind tibiæ without spur at base. Wings hyaline, elongate-ovate, venation typical of genus; first marginal cell elongate; pterostigma large.

Genitalia.—Male.—Genitalia as in *Aphalara;* anal valve with a similar long, caudal projection from the perpendicular axis; forceps slender, converging to an acute point, bowed. *Female.*—Genital segment about as long as rest of abdomen, very acutely pointed, dorsal valve a little longer than ventral, with long pubescence dorsad.

Described from eight males and females from Savannah, Georgia (Schwarz), April 15, 1884. These bear the label "*Aphalara ilicis* Ashmead." This is an entirely different insect from that described by myself recently from Florida (Crawford '11c: 629,632), and called *Psyllopa floridensis* first and then corrected to *Psyllopa ilicis.* Judging from Ashmead's description of the nymph, I am inclined to believe that the latter is correct, while the present species, of *Pauro-*

cephala, is a distinct and new species. However, since these have been determined as Ashmead's *ilicis* and the other is merely a surmise, *ilicis* should be placed in *Paurocephala* and the Florida species become *Psyllopa floridensis*. The latter species, it is shown later (p. 129), is identical with *Arytaina amorphæ* (Mally).

HETEROPSYLLA, new genus.

Body usually small. Head short, rather small, deflexed, rounded forward and down in front, but less evenly so than in preceding genus; genæ somewhat swollen beneath vertex, but not produced into conical processes; with the frons as a visible sclerite between the genæ and forming the bottom of a groove between them, somewhat resembling *Aphalaroida* in shape of frons; clypeus pyriform, not large. Eyes medium to small in size. Antennæ very long and very slender. Thorax not strongly arched; propleurites narrow, largely concealed by receding head. Wings broadly rounded at apex, hyaline, with a broad pterostigma.

Type of genus.—Heteropsylla texana, new species.

SYNOPSIS OF SPECIES.

a¹. Forewings maculated apically around marginal cells and on apex of radial sector; genæ conspicuously swollen ventrad; male forceps bidentate at apex. .... *texana*, new species.

a². Forewings not maculated; hyaline or indistinctly fumate, transparent; genæ not conspicuously swollen ventrad.

  b¹. Antennæ distinctly more than twice as long as width of head, usually at least two and a half times as long; frons partially or nearly entirely covered by genæ.

    c¹. Forceps of male very long, arcuate caudad, divided from base into two parts; anterior part thin, sulcate, square at tip; posterior part spiniform, as long as other part, scarcely pubescent.................. *forcipata*, new species.

    c². Forceps of male about half as long as in *forcipata*, divided from base, but posterior part very slender and inconspicuous; pubescence much denser .... *mexicana*, new species.

  b². Antennæ not over twice as long as width of head; frons entirely visible.

    c¹. Female genital segment almost as long as rest of abdomen, dorsal valve distinctly longer than ventral.

      d¹. Forceps of male as long as anal valve or longer; forewings clear; body very often light colored.

        e¹. Forceps with a long posterior, spiniform process, extending from near base to near tip; dorsal valve of female genital segment less than twice as long as ventral.............................. *cubana*, new species.

        e². Forceps larger, with a short process arising from near middle and extending obliquely inward and upward; dorsal valve of female genital segment fully twice as long as ventral:.................... *quassiæ*, new species.

      d². Forceps of male about half as long as anal valve, very short; forewings slightly fumate; head and thorax usually dark colored. . *fusca*, new species.

    c². Female genital segment exceedingly short; ventral valve much shorter than dorsal; male forceps somewhat similar to those of *cubana*. *mimosæ*, new species.

HETEROPSYLLA TEXANA, new species.

Figs. 70, 246, 295, 456.

Length of body 1.5 mm.; length of forewing 2.1; width of head 0.75. General color orange yellow to reddish brown; abdomen often lighter than thorax and head, sometimes darker; mesonotum often striped with brown.

Head about as broad as thorax, deflexed, rounded forward between antennæ, slightly strigate, arcuate on posterior margin; vertex with a slight foveal depression on each side of median line, elevated on postocellar regions, not emarginate in front at median line; genæ large and swollen, with a long seta at apex of swelling; frons not covered by genæ, visible as a small sclerite between the genæ but not forming a smooth surface with the latter, appearing somewhat as a short stalk of the front ocellus. Antennæ about twice as long as width of head or more, very slender.

Thorax arched, rather broad, coarsely punctate; pronotum short, attaining laterad about to upper margin of eyes; pleural suture long, oblique; pleurites narrow. Wings relatively large, hyaline, maculated on basal and apical margins, with a brown macula at tip of claval suture, a curved one around the forks of the cubitus, and another at tip of radial sector; about two and a fifth times as long as broad, broad and broadly rounded apically; first marginal cell larger than second; pterostigma yellowish, rather short.

Genitalia.—*Male.*—Forceps short, broad, rather deeply notched at tip, with posterior process longer than anterior, both acute; anal valve short, simple, slender, truncate at apex, pubescence sparse.—*Female.*—Genital segment moderately long, acute; dorsal valve distinctly longer than ventral, with a prominent convexity dorsad at base.

Described from many males and females in a collection sent to me by Mr. W. D. Hunter, and many in the United States National Museum collection. Type-locality: Devils River, Texas (E. A. Schwarz), on *Pithecolobium;* also, on *Sphaeralcea angustifolia* (F. C. Pratt), and on *Monarda citriodora,* in the same locality; other localities: Dallas, Texas (W. W. Yothers and C. R. Jones); Corpus Christi, Texas (R. A. Cushman), on *Chrysopsis sp.;* Galveston, Texas (W. D. Pierce), on *Tamarax gallica;* San Antonio, Texas (E. A. Schwarz, F. C. Pratt), on *Celtis pallida;* Kerrville, Texas (Pratt), at light; Cuero, Texas (Cushman); Victoria, Texas (J. D. Mitchell), on *Acacia;* Plano, Texas (Tucker). The dates of collection range from March to August. In the National Museum collection as follows: Wades, Texas (Hubbard and Schwarz), on *Prosopis juliflor,* May 22; Austin, Texas, on *Prosopis sp.*, August 7, 1894; Fort Yuma, Arizona (Hubbard), on *Prosopis juliflor,* January 21; Colorado (C. P. Gillette), no data; Wellington, Kansas (E. G. Kelly). Some of these specimens are labeled *Pseudaphalara prosopis* Schwarz (manuscript).

Type in author's collection.

HETEROPSYLLA MEXICANA, new species.

Figs. 68, 244, 293, 455.

Length of body, 2 mm; length of forewing, 2.2; width of head, 0.76. General color, light brown to black.

Head almost as broad as thorax, scarcely deflexed, punctate; vertex similar to preceding species, not elevated on posterior margin, and less elevated on postocellar regions; genæ less swollen than in preceding species, but somewhat bulging roundly on each side of frons; frons small, often scarcely visible, being mostly covered by genæ. Antennæ about two and one-half times as long as width of head.

Thorax not strongly arched, coarsely punctate. Pronotum rather long, flat, reaching laterad to a little below upper margin of eyes; præscutum shorter than in preceding species. Wings hyaline, without maculæ, about two and a fourth times as long as broad, broadly rounded at apex; first marginal cell slightly smaller than second and different in shape; pterostigma brownish, almost as long as radial sector.

Genitalia.—*Male.*—Genitalia rather small; forceps short, about as long as anal valve, deeply divided from near base into an anterior, thin, slightly sulcate process, and a posterior, slender, spiniform process; anal valve simple, curved, slender; pubescence prominent.—*Female.*—Genital segment moderately long, acute at apex; dorsal valve much longer than ventral, with one long seta on dorsal surface.

Described from two males and five females collected at Jalapa, Mexico (Crawford), August 28, 1910.

Type in author's collection.

HETEROPSYLLA FORCIPATA, new species.

Figs. 116, 118.

This species is very closely related to *mexicana*, differing chiefly and widely in male genital characters. The forceps are nearly twice as long as the anal valve and arcuately curved forward; deeply divided as in *mexicana*, but the anterior portion more deeply sulcate and forming a groove in which lies the long posterior spiniform process, very acute at apex and as long as anterior part; pubescence very slight.

Described from one male from Oaxaca, Mexico (A. Koebele).

Type.—Cat. No. 18074, U. S. Nat. Mus.

HETEROPSYLLA CUBANA, new species.

Figs. 69, 245, 294, 458.

Length of body, 1.5 mm; length of forewing, 1.6; width of head, 0.71. General color, greenish yellow to yellowish brown throughout.

Head about as broad as thorax, rounded in front, punctate; vertex arcuate on posterior margin but not elevated there, with a prominent and deep fovea on each side of median line in rear center, elevated slightly on postocellar regions; genæ large, rather prominent; frons usually mostly covered by genæ but not entirely, visible as a small sclerite. Antennæ about twice as long as width of head.

Thorax arched, coarsely punctate, slightly pubescent. Pronotum rather long, flat; propleurites long and narrow; præscutum short. Wings small, hyaline, about two and one-third times as long as broad, broadly rounded at apex or somewhat squarish; first marginal cell larger than second; pterostigma rather long, and broad at base, yellowish.

Genitalia.—*Male.*—Genital segment small, rounded; forceps longer than anal valve, elliptical in profile, with a short narrow pedicel, rather flattened, with a long spiniform process arising from inner surface near base and extending backward and upward along posterior margin of forceps to near apex. Anal valve short, rather cylindrical, truncate at apex, sometimes nearly as long as forceps.—*Female.*—Genital segment almost as long as rest of abdomen, acute at apex, dorsal valve longer than ventral.

Described from numerous males and females collected at Havana, Cuba, by C. F. Baker, occurring in great numbers on *Leucaena glauca;* several specimens in the U. S. National Museum collection from Santiago de las Vegas, Cuba (P. Cardin), on *Poinciana regia*, December 29, 1910. Both plants belong to the Leguminosæ, the former being closely related to *Mimosa*, which is the food plant of another species of this same genus, in Texas.

Type in author's collection.

HETEROPSYLLA QUASSIÆ, new species.

Figs. 113, 117.

Length of body 1.5 mm; length of forewing 1.7; width of head 0.72. General color light yellowish orange to orange, vertex and dorsum of thorax sometimes brown, always more or less distinctly strigate.

Head and thorax similar in most respects to the following species (*fusca*). Forewings seldom fumate, sometimes very slightly so, usually clear. Male genital segment not as small as in *fusca;* forceps as long as anal valve, strap-shaped, curved inward at apex, tip rounded, black, sides parallel; with a short process on posterior side near middle, extending upward and inward for a short distance. Anal valve moderately long, of usual cylindrical shape. Female genital segment as in *fusca*.

Described from two males and seven females from the Bahama Islands, some of them from Nassau Island (Schwarz), March 27, 1879; and the rest from Long Island, April 3, 1879, on *Quassia* sp.

Type.—Cat. No. 18075, U. S. Nat. Mus.

HETEROPSYLLA FUSCA, new species.

Figs. 119, 125.

Length of body 1.5 mm; length of forewing 1.9; width of head 0.73. General color brown to dark brown on head and thoracic dorsum, yellow on venter and abdomen; apical half of antennæ, and sometimes femora, brown.

Head relatively rather large, as broad as thorax, surface distinctly strigate; vertex moderately long, not as long as broad, with the usual two foveal impressions, rounded in front; genæ less swollen than in most other species of the genus; frons largely visible, only slightly covered by genæ. Eyes large. Antennæ about twice as long as width of head.

Thorax arched, moderately broad, distinctly strigate on dorsum. Forewings slightly fumate over most of surface, similar in shape and venation to cogenors.

Genitalia.—*Male.*—Genital segment small; forceps small, very short, not much longer than broad, oval in profile, with a posterior spiniform process almost as long as main portion and lying closely appressed to it. Anal valve nearly twice as long as forceps, cylindrical, distal third narrowed, truncate at apex, pubescent. *Female.*—Genital segment as long as rest of abdomen; dorsal valve nearly twice as long as ventral, both acute.

Described from two males and four females from Santo Domingo, West Indies (Aug. Busck), August 6 and 7, 1905.

Type.—Cat. No. 18076, U. S. Nat. Mus.

HETEROPSYLLA MIMOSÆ, new species.

This species resembles more or less closely *mexicana* and *cubana* in some respects but is smaller than either. General color light orange to reddish brown.

Head as broad as thorax; vertex only very slightly impressed discally; frons largely visible between genæ; antennæ about twice as long as width of head. Forewings clear, venation similar.

Genitalia.—*Male.*—Genital segment small; forceps similar in outline to those of *fusca*, with a large, prominent spiniform process behind and between. Anal valve very short and thick. *Female.*—Genital segment exceedingly short, ventral valve sometimes scarcely visible, much shorter than dorsal.

Described from 18 males and females from Columbus, Texas (Schwarz), on *Mimosa sp.*, August 16; Brownsville, Texas (Hubbard and Schwarz), June; Victoria, Texas, July 29, 1903.

Type.—Cat. No. 18077, U. S. Nat. Mus.

Genus CALOPHYA Loew.

Body usually small to medium in size, robust. Head very short, seldom as broad as thorax; vertex smooth or impressed discally with foveæ, more or less roundly convex in front, sometimes very uniformly so, as in *Paurocephala;* genæ swollen, and usually produced into conical processes which may be very short and inconspicuous or quite long and acutely pointed; frons usually mostly covered by genæ, but often partially visible. Antennæ short and rather thick, seldom longer than width of head; terminal setæ rather long; segment III often nearly as long as IV–X combined. Thorax strongly arched, broad; propleurites largely covered by eyes. Forewings ovate, or more or less pointed at apex, hyaline to opaque, with a pterostigma; first marginal cell usually much larger than second.

Type of genus.—Calophya rhois Loew (not Glover).

The members of this genus, so far as is known, are confined, in this country, to species of *Rhus* (Sumach) and have been called the Sumach Psyllids. One species, *C. rhois* Loew, has been described from Europe and four from Japan by Kuwayama (*C. nigra, nigridorsalis, viridis,* and *viridiscutellata*). Five forms are known in this country. There is more or less close resemblance between this genus and *Pauropsylla* of which there are no American representatives.

SYNOPSIS OF SPECIES.

a^1. Genal cones distinctly longer than the width at base, coniform; wings rounded at apex.
  b^1. Cones very long, slender, white; wings hyaline, shining, slightly fumate along forks of media and cubitus; vertex and thorax black or brown. *californica* Schwarz.
  b^2. Cones not very long, only a little longer than basal width, acute.
    c^1. Cones thick at base, contiguous basally, divergent; wings yellowish, transparent; body in both sexes uniformly honey yellow........*flavida* Schwarz.
    c^2. Cones slender, distinctly separated at base and extending outward; wings clear; head and thorax of male black, abdomen yellow; female yellow. *dubia*, new species.
a^2. Genal cones not longer than broad, usually very much reduced and not markedly coniform; wings more or less angulate at apex.
  b^1. Wings black or brown, not transparent, only semiangulate at apex; pterostigma very long; vertex black, depressed; posterior ocelli not visible from side; thorax orange yellow; praescutum not long; genal cones subacute at apex, directed forward; female genital segment short.............*nigripennis* Riley.
  b^2. Wings hyaline, transparent, shining, rather acute at apex; pterostigma very short and small; praescutum long; genal cones very short, subacute at apex, directed inward.
    c^1. Vertex and thorax black or brown; wing with a large brown macula at base of anterior basal cell ....*triozomima* Schwarz.
    c^2. Vertex and thorax honey yellow; wing clear, without macula in basal cell. *triozomima claripennis*, new variety.

CALOPHYA CALIFORNICA Schwarz.

Figs. 75, 248, 298, 463

Calophya californica SCHWARZ '04:242.

Length of body 1.6 mm.; length of forewing 1.8; width of head 0.69. General color black to brown; vertex and thorax shining black to light brown above, flavous ventrad; abdomen dark, except base and genital segment flavous; genal cones white; antennæ pale yellow except at tip; legs pale yellow, femora partially brown; wings clear.

Vertex very broadly impressed discally on each side of median line and somewhat bulging forward in front on each side of median line, very slightly pubescent; genal cones about half as long as vertex, more or less divergent, subhorizontal, scarcely visible from directly above, acute at tip, slightly pubescent. Antennæ about as long as width of head, rather thick, black at tip.

Thorax strongly arched, strigate dorsad; pronotum rather long. Forewings oval, about two and one-third times as long as broad, rounded at apex but not broadly so, clear, with a tinge of milky white sometimes apparent; pterostigma long and rather narrow; first marginal cell about twice as large as second.

Genitalia.—Male.—Genital segment usually pale straw-yellow; anal valve very large, broad, larger than ventral plate of segment; forceps moderately long, flattened, tip curved inward and forward, acute. *Female.*—Genital segment as long as three preceding ventral sclerites, very acute at apex, dorsal valve a little longer than ventral.

Described from many males and females from Claremont, California (Crawford), on *Rhus integrifolia*, April, 1910; several from Los Angeles, California (Koebele), on the same host plant, in March. The latter are paratypes.

Type.—Cat. No. 8147, U. S. Nat. Mus.

CALOPHYA FLAVIDA Schwarz.

Fig. 419.

Calophya flavida SCHWARZ '04:243.

Length of body 1.5 mm.; length of forewing 1.9; width of head 0.70. General color uniformly honey yellow; legs and antennæ paler, thorax sometimes with ill-defined markings of a pale brown color.

Head and thorax smooth, shining; vertex convexly rounded forward and down with a slight foveal impression on each side of median line (sometimes larger and very prominent); genæ distinctly coniform, stout, a little longer than basal width, scarcely one-third as long as vertex, contiguous at base, divergent, acute at apex, scarcely pubescent. Antennæ shorter than width of head, thick, slightly darker at tip.

Thorax broad, strongly arched, smooth. Forewings about two and one-third times as long as broad, rounded broadly at apex, pale yellow and scarcely shining, moderately transparent; pterostigma long, rather large; first marginal cell about twice as large as second.

Genitalia.—Male.—Anal valve relatively narrower than in *californica*, oblong-oval in profile; forceps similar in shape to *californica*. *Female.*—Genital segment a little longer than preceding ventral sclerite, very acute; dorsal valve scarcely longer than ventral.

Described from one male and five females from Washington, District of Columbia (Schwarz), on *Rhus glabra*, in May. These are apparently paratypes. Recorded also from Massachusetts and St. Louis, Missouri, by Mr. Schwarz.

Type.—Cat. No. 8148, U. S. Nat. Mus.

CALOPHYA DUBIA, new species.

Fig. 420.

Length of body 1.5 mm.; length of forewing 1.8; width of head 0.68. General color (male) head and thorax black dorsad, venter and abdomen yellow; legs, genal cones, antennæ (except tips) yellow. Female (see note below) honey yellow, as in *flavida*. Body rather small.

Vertex a little more flattened than in *flavida*, more deeply impressed discally, rounded down in front, smooth; genal cones well separated at base, a little longer than basal width, curved outward and subhorizontal, acute at tip, not pubescent. Antennæ nearly as long as width of head, rather thick.

Thorax arched, strigate dorsad. Forewings clear, or very slightly yellowish, transparent, rounded at apex rather narrowly; pterostigma short and broad; first marginal cell fully twice as large as second, or larger.

Genitalia.—Male.—Genitalia similar in general to first species; anal valve longer than broad, posterior margin arcuately rounded; forceps as in *californica*. *Female.*—Genital segment very short, about as long as preceding ventral sclerite; dorsal valve a little longer than ventral.

Described from one pair from Colorado, with no data accompanying them.

Type.—Cat. No. 18078, U. S. Nat. Mus. Female in author's collection.

This species seems to be distinct from all others, but it is with hesitation that it is described as new because of the absence of data. There can be no certainty that the female belongs to the same species as the male described above, but in spite of the color differences, the structure seems to indicate that they are the same species.

CALOPHYA TRIOZOMIMA Schwarz.

Figs. 74, 297, 462.

Calophya triozomima Schwarz '04: 241.

Length of body 1.7 mm; length of forewing 2.1; width of head 0.72. Vertex and thorax reddish brown to black; abdomen and legs yellowish; genal cones light orange; antennæ yellow, darker at tip. Body stout; surface smooth or slightly alutaceous.

Vertex moderately large, strongly rounded down in front; discal impressions variable, often large and extensive; genal cones very small, scarcely coniform, rather transverse, not visible from above, not acutely pointed. Antennæ not as long as width of head, thick.

Thorax stout, broad, strongly arched; dorsal surface punctate and strigate, more or less shining. Forewings about two and a third times as long as broad, hyaline, often with a yellowish tinge, transparent, distinctly angulate at apex; with a large black macula in anterior basal cell; veins prominent; pterostigma very small; first marginal cell about three times as large as second.

Genitalia.—Male.—Anal valve much longer than broad, both front and hind margins arcuate, narrow at apex; forceps similar in shape to *californica*, rather long, acute at tip. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve very acuminate, and acute at apex, longer than ventral.

Described from many males and females from Oracle and Santa Rita Mountains, Arizona (Hubbard and Schwarz), on *Rhus trilobata*, June and July (these are paratypes); several from Los Angeles County, California (Coquillett); Claremont, California (Baker); Boulder, Colorado (E. Bethel), on *Rhus trilobata;* Fort Collins, Colorado.

Type.—Cat. No. 8149, U. S. Nat. Mus.

CALOPHYA TRIOZOMIMA CLARIPENNIS, new variety.

This varietal form is very similar structurally to the species, but differs in the following respects. The vertex is more flattened and the front ocellus more nearly visible from above. The color differences are marked. The body is uniformly honey-yellow throughout; the forewing lacks the dark macula in the basal cell present in the species. The genital characters are quite similar.

Described from one male and three females from Galiuro Mountains, Arizona (H. G. Hubbard), on *Rhus* sp., May 25; and two females from Pagosa Springs, Colorado (Baker).

Type.—Cat. No. 18079, U. S. Nat. Mus.

CALOPHYA NIGRIPENNIS Riley.

Figs. 76, 250, 299, 464.

Psylla rhois GLOVER (not Loew) '77: 33.
Calophya rhois RILEY '83: 69.
Calophya nigripennis RILEY '83: 69.—SCHWARZ '04: 244.

Length of body 1.7 mm; length of forewing 2.1; width of head 0.72. Color of vertex, wings, and anterior and middle femora black to brown, wings sometimes light brown; abdomen light brown to almost black; genal cones and thorax bright orange or sulfur-yellow; antennæ, except at tip, posterior femora and all tibiæ pale yellow.

Vertex smooth, seldom alutaceous, shining, very convexly rounded downward in front, more so than in the other species of the genus. Genal cones small, not as long as basal width, often distinctly shorter, acute at apex, divergent, subhorizontal, not pubescent, contiguous at base. Antennæ shorter than width of head, thick, always black at tip.

Thorax smooth, less strongly arched than in preceding species, sometimes faintly alutaceous, sometimes striped on dorsum. Forewings thick, not transparent, somewhat punctulate, narrowly rounded at apex, about two and a half times as long as broad; pterostigma long and large; first marginal cell about twice as large as second. Hind wings somewhat fumate.

Genitalia.—Male.—Genitalia similar to *flavida;* anal valve broad, about two-thirds as broad as long, convex on both hind and front margins; forceps as in *flavida. Female.*—Genital segment scarcely as long as two preceding ventral sclerites, stout, not acuminate.

Described from six males and females from Washington, D. C. (Schwarz), on *Rhus copallina*, in May; several from Raleigh, North Carolina (E. P. Van Duzee), April; Falls Church, Virginia, June; Alabama; Pennsylvania (no data on the latter specimens). Mr. Schwarz gives, also, "various parts of Georgia."

Schwarz states that immature specimens resemble *flavida* but may be distinguished by the shorter vertex, shorter genal cones, differences in the genitalia, and slight differences in wing venation.

Subfamily CARSIDARINÆ.

Head deeply cleft in front, giving a bi-rostrate appearance, which is increased by the large basal antennal segments. Genæ variable in form, sometimes swollen into small or larger conical processes beneath antennal bases, sometimes not at all swollen; frons usually covered by genæ, somewhat as in Psyllinæ, or sometimes not covered and easily visible between genæ, as in Pauropsyllinæ. Antennæ usually long and slender, sometimes much thickened. Thorax not strongly arched. Hind tibiæ often with a spur at base. Wings hyaline, variously shaped, branching of veins usually not so typically dichotomous as in Psyllinæ (see illustrations of wings of *Carsidara*, especially the medial vein).

The members of this subfamily seem to be mostly tropical in their distribution. Four, out of a dozen or more genera, are represented in the American tropics and subtropics. The most characteristic feature of the group is the deeply cleft head and the peculiar type of wing venation, which is rather difficult to define. In this, as in the preceding subfamily, one genus distinctly *triozine* in many respects has been included. The relationships of this triozine genus, *Rhinopsylla*, to Carsidarinæ seem to be closer than to Triozinæ.

SYNOPSIS OF GENERA.

a^1. Frons not covered by genæ; antennæ greatly thickened in basal half.
  b^1. Antennæ much longer than body; genæ produced into two small, inferior cones; frons rather large; clypeus large; hind tibiæ without basal spur. *Freysuila* Aleman.
  b^2. Antennæ much shorter than body; genæ not produced as above; frons very narrow; clypeus small; hind tibiæ with a spur at base....*Epicarsa* Crawford.
a^2. Frons covered by genæ, but sometimes not entirely so; antennæ not thickened in basal half.
  b^1. Cubital petiole (M+Cu) present; head very deeply cleft in front; anterior ocellus above; pterostigma present in forewing............*Carsidara* Walker.
  b^2. Cubital petiole and pterostigma wanting (as in *Trioza*); head less deeply cleft; anterior ocellus in front ....*Rhinopsylla* Riley.

Genus FREYSUILA Aleman.

Frey-suila ALEMAN, '87: 21–26.
Freysuila SCHWARZ, '97:196.

Head very deeply cleft in front and deeply concave between posterior ocelli, strongly birostrate, with the thick antennæ attached to truncate apex of rostrate lobes and increasing the rostrate appearance; frons not covered by genæ, visible as an oblong sclerite between genæ; genæ swollen beneath antennæ, with a small inferior epiphysis; clypeus large. Antennæ very long; third joint unusually long and thick. Thorax large, broad, coarsely punctate. Hind tibiæ without spur at base. Wings large, hyaline, rounded at apex; pterostigma present.

Type of genus.—*Freysuila dugesii* Aleman.

SYNOPSIS OF SPECIES.

a^1. Third antennal joint not over twice as long as fourth, usually flavous; color of body uniformly flavous.
  b^1. Third antennal joint about twice as long as fourth; genal epiphyses acutely pointed; M+Cu shorter than R; veins yellow.................*dugesii* Aleman.
  b^2. Third antennal joint only a little longer than fourth; genal epiphyses smaller, not acutely pointed; M+Cu as long as R; veins black.......*ernstii* Schwarz.
a^2. Third antennal joint nearly four times as long as fourth, black; vertex and thoracic dorsum with conspicuous black spots and bands (or brown); M+Cu shorter than R...*cedrelæ* Schwarz.

FREYSUILA DUGESII Aleman.

Figs. 122, 124, 408.

Frey-suila dugèsii ALEMAN '87:21.
Freysuila dugesii SCHWARZ '97:197.—CRAWFORD '11b:491.

Length of body 3 mm.; length of forewing 4.8; width of head 0.95; length of antennæ 4. General color flavous; antennæ black on segments V–X, basal joints flavous.

Head broad, surface smooth or very finely punctate. Anterior ocellus in front at base of cleft; genæ produced beneath into a pair of small conical processes directed downward. Antennæ longer than body; I and II very large; III not quite twice as long as IV, fusiform, and very thick in the middle; IV to X more slender. Legs long, rather thick. Wings large, broadly rounded at apex; veins flavous; first marginal cell much larger than second. M + Cu shorter than R.

Genitalia.—Female.—Genital segment as long as rest of abdomen, about 1 mm. long; dorsal valve longer than ventral, acutely pointed; both valves with a tuft of long hairs near apex.

Described from two females from Guanajuato, Mexico (Duges), on *Cedrela* sp. These are two of the specimens sent by Mr. Duges to the United States National Museum some years ago, on which Schwarz based his description.

FREYSUILA ERNSTII Schwarz.

Freysuila dugesii ernstii SCHWARZ '97:197.

Very close to *dugesii*, differing in only a few respects; third antennal segment only a little longer than fourth; genæ swollen much less, processes not conical. Wings broader; M + Cu equal in length to R; pterostigma a little longer; veins black.

Genitalia.—Male.—Anal valve small, not longer than forceps, simple; forceps thick, cultrate, acute at apex, inner edge rather sharp.

Described from one male (paratype), from Caracas, Venezuela (A. Ernst), on *Cedrela*, April 20, 1894.

FREYSUILA CEDRELÆ Schwarz.

Fig. 417.

Freysuila dugesii cedrelæ SCHWARZ '97:197.

Close to *dugesii*, differing as follows: Color flavous, with a brown streak on each side of vertex, another behind each eye, extending to wing base; a brown spot on front of præscutum and a brown stripe on each side of scutum just above the wings; venter yellow; antennæ entirely black. Third antennal segment nearly four times as long as fourth; genal epiphyses acutely pointed. Wings large, as in *ernstii*, but with M+Cu shorter than R; veins black. Female genital segment much shorter than rest of abdomen.

Described from two females (paratypes), from Trinidad, West Indies (F. W. Urich), on *Cedrela odorata*, January 29, 1894.

Genus EPICARSA Crawford.

Epicarsa Crawford, '11b: 488.

This genus is close to *Freysuila*, differing in the following characters: Head less deeply cleft in front; vertex only a little concave between posterior ocelli; frons narrow; genæ with a minute epiphysis beneath each antennal base; clypeus very small. Antennæ shorter than body, greatly thickened from base to tip. Hind tibiæ with a spur at base. Wings rounded; Rs and M almost touching; first marginal cell smaller than second; pterostigma wanting.

Type of genus.—Epicarsa corniculata Crawford.

EPICARSA CORNICULATA Crawford.

Figs. 152, 153, 157, 497.

Epicarsa corniculata Crawford '11b: 488.

Length of body 1.9 mm.; length of forewing 2.5; width of head 0.75. General color dark brown or black; head and prothorax jet black; abdomen lighter; genitalia yellowish brown.

Head not deflexed, almost as broad as thorax, finely punctate; vertex elevated somewhat on postocellar regions, concave between posterior ocelli but less so than in preceding genus; with a conspicuous epiphysis near eye, over insertion of antennæ. Eyes rather large; posterior ocelli reniform in shape, situated well forward; anterior ocellus in front at apex of excision, visible from above. Antennæ about three times as long as width of head, very stout and thick; two basal segments very large; third about as long as first two together.

Thorax rather flattened; pronotum long, flat on dorsal surface; pleurites very large and long; pleural suture oblique, almost as long as episternum. Spur at base of hind tibiæ not very large, but conspicuous. Wings large, hyaline, shining, less than two and a half times as long as broad, quite broadly rounded at apex; first marginal cell much smaller than second; second very large; venation very distinctive (see figure); with a black band along M_3 and Rs; a black band, also, along Cu_1 and a third on R_1.

Genitalia.—Male.—Genital segment relatively rather small; forceps short and slender; anal valve small, simple.

Described from one male collected at Para, Brazil, by C. F. Baker. Type in author's collection.

Genus CARSIDARA Walker.

Carsidara WALKER '69: 329.—SCOTT '82: 466.—CRAWFORD '11b: 484.

Head very deeply cleft in front; vertex short, lobes diverging toward anterior margin of eyes; genæ large, composing anterior portion of what *appears* to be the vertex; front ocellus at end of median line of vertex, near the middle of the top of the head; genæ not produced below, as in *Freysuila;* frons mostly covered by genæ, sometimes slightly visible. Antennæ very long and slender. Beak long. Thorax not broad. Hind tibiæ with a large spur at base. Wings hyaline, angulate at apex, with a pterostigma.

Type of genus.—Carsidara marginalis Walker.

The four following species from the American tropics are very closely related to each other. This seems to be a tropical genus almost exclusively.

SYNOPSIS OF SPECIES.

- **a^1.** Length to tip of folded wings about 5 mm.; head large, subglobose in profile. *gigantea* Crawford.
- **a^2.** Length about 4 mm., or less.
  - **b^1.** Thoracic dorsum conspicuously striped; length sometimes slightly over 4 mm. *dugesii* Loew.
  - **b^2.** Thoracic dorsum pale, not striped, or at most very indistinctly so; size smaller.
    - c^1. Color flavous; body surface not pluverulent............... *mexicana* Crawford.
    - c^2. Color whitish; body surface pulverulent; sometimes indistinctly striped on dorsum of thorax.. *concolor* Crawford.

CARSIDARA GIGANTEA Crawford.

Figs. 149, 151, 373, 492.

Carsidara gigantea CRAWFORD '11b: 486.

Length of body 3 mm.; length of forewing 4.3; width of head 0.96. General color light yellowish brown; thoracic dorsum with yellowish or pale stripes; distal portions of antennal segments black. Body large.

Head not deflexed, finely punctate, not quite as broad as thorax, arcuate on posterior margin; vertex with a deep sulcate depression between posterior and anterior ocelli, and a lesser one extending outward on each side from anterior ocellus; anterior ocellus almost in the middle of the top of the head (vertex and genæ together); posterior ocelli situated well forward, almost in a line transversely with anterior ocellus. Clypeus very small, inconspicuous; beak very long; slender and acutely pointed. Antennæ fully as long as body, very slender.

Thorax long, rather large, punctate, striped. Propleurites large; pleural suture curved; præscutum long and rather broad. Basal spur on hind tibiæ large and conspicuous. Wings large, hyaline, shining, about two and three fourths times as long as broad, rather acute at apex; first marginal cell much smaller than second; pterostigmal space open, large, long.

Genitalia.—Female.—Genital segment very stout, relatively short, rather acute at apex; dorsal valve large, abruptly acute at apex; ventral valve more slender, equal in length to dorsal; pubescence rather dense and long.

Described from three females collected at Granada, Nicaragua, by C. F. Baker.

Type in author's collection.

CARSIDARA DUGESII Loew.

Figs. 148, 150, 374, 494.

Carsidara dugesii Loew '86: 160.
Carsidara rostrata Crawford '11b: 486.

Close to *gigantea*, but distinctly smaller; color light brown, striped similarly; vertex with sulcate depressions distinctly different (see figure). Second marginal cell of forewing relatively larger; pterostigma slightly thickened. Female genital segment more slender, with a longer, more slender, and upturned termination.

Described from three females (one not typically colored), from Chinandega, Nicaragua (C. F. Baker). Judging from the similarities in size, color, general appearance, and habitat, *rostrata* Crawford is probably identical with Loew's *dugesii*, which was described from Mexico (collector, A. Duges), on a species of Malvaceæ.

CARSIDARA MEXICANA Crawford.

Figs. 147, 160, 385, 496.

Carsidara mexicana Crawford '11b: 487.

Close to *dugesii* and possibly not a distinct species. Thoracic dorsum with no indication of stripes; color uniformly flavous or yellow. Vertex and thorax similar in structure and appearance; pterostigma of forewing not thickened as above.

Genitalia.—Male.—Anal valve large, almost as long as genital segment, with a short, large posterior lobe, somewhat as Loew figures for *dugesii*, but apical portion much shorter; forceps long, strongly curved, obtuse at apex; second pair of forceps shorter, very acutely pointed.

Described from one male from Acapulco, Mexico (C. F. Baker).

Type in author's collection.

CARSIDARA CONCOLOR Crawford.

Figs. 146, 159, 375, 495.

Carsidara concolor Crawford '11b: 484.

Similar to *dugesii*, but differing sharply in being whitish and more or less pulverulent; thoracic dorsum not or very indistinctly striped as in *dugesii;* size uniformly smaller; body and wings more slender; vertex with sulcate depressions much less marked and conspicuous. Female genitalia somewhat similar; male anal valve similar but with apical portion much shorter and broader.

Described from many males and females from Habana, Cuba (Baker).

Type in author's collection.

Genus RHINOPSYLLA Riley.

Rhinopsylla RILEY '83:77.—CRAWFORD '11a:440; '11b:483.

Head often less deeply cleft in front than in preceding genera, though sometimes very deeply cleft; anterior ocellus in front, as in *Freysuila;* frons covered by genæ; genæ sometimes swollen (approaching *Kuwayama* of Triozinæ). Antennæ long. Thorax only slightly arched. Legs long and slender; hind tibiæ with a small spur at base, or often none. Wings *triozine,* with no cubital petiole (M+Cu) and no pterostigma, but resembling preceding genera somewhat also.

Type of genus—Rhinopsylla schwarzii Riley.

This is a very interesting genus, in that it grades into *Kuwayama* of the Triozinæ on the one hand, and other species grade into the preceding genera of Carsidarinæ on the other hand. There are unmistakable relationships to both subfamilies, but the most fundamental characters seem to indicate a closer relationship with the Carsidarinæ.

SYNOPSIS OF SPECIES.

a^1. Head very deeply cleft in front; eyes appearing as if stalked; forefemora (of male at least) greatly enlarged.................................*schwarzii* Riley.

a^2. Head not very deeply cleft in front; forefemora not greatly enlarged.

  b^1. Legs extremely long and slender; tibiæ much longer than femora; head moderately deeply cleft; third antennal joint thickened.

    c^1. Head and thorax shining black, abdomen flavous; vertex smooth and shining, deeply concave between posterior ocelli; forefemora slightly enlarged. *athenæ,* new species.

    c^2. Color flavous; vertex punctate, deeply concave between posterior ocelli; forefemora scarcely enlarged..........................*jalapensis* Crawford.

  b^2. Legs not unusually long; tibiæ only a little longer than femora; third antennal joint not thickened.

    c^1. Body black; head moderately deeply cleft in front; antennæ broad at base. *antennata* Crawford.

    c^2. Body orange to flavous; head not deeply cleft; antennæ smaller at base. *antennata proxima* Crawford.

RHINOPSYLLA SCHWARZII Riley.

Rhinopsylla schwarzii RILEY '83:78.—CRAWFORD '11a:441.

Length to tip of folded wings about 3 mm. General color dull reddish on head and thorax, abdomen greenish; femora red, tibiæ flavous; thoracic dorsum with indistinct pale stripes; antennæ pale on joints III to VI.

Head very deeply cleft in front, strongly birostrate; eyes appearing to be stalked because of this rostrate condition; antennæ very thick at base and increasing rostrate appearance; genæ scarcely swollen beneath antennal bases; third antennal segment distinctly thicker than succeeding joints, longer than IV and V combined; total length of antennæ more than twice width of head. Thorax slightly arched. Legs long, front pair longest; forefemora greatly enlarged in male (female not known), and curved strongly; hind tibiæ not spurred at base, but distinctly swollen. Wings more than three times as long as broad, acute at apex.

Genitalia obscured in both cotypes. Male genitalia very small.

Described from the two cotypes in the National Museum (together with Riley's original description). One of the specimens is all destroyed except the abdomen. Collected at Baldwin, Florida, by E. A. Schwarz, March 11, 1879, on "low plants in the cypress swamps".

RHINOPSYLLA ATHENÆ, new species.

Figs. 123, 409.

Length of body 1.9 mm; length of forewing 3; width of head 0.72. General color deep shining black on head, pronotum, and præscutum; rest of body flavous orange; antennæ black, except IV and V and tip of III white; male genitalia a little darker than rest of abdomen.

Somewhat similar to *schwarzii*, but head not so strongly birostrate, not so deeply cleft, not as broad as thorax; eyes hemispherical and directed somewhat forward (as in *schwarzii* also), but not giving the appearance of being stalked; antennæ somewhat similar, but third joint less swollen.

Thorax scarcely arched; pronotum rather long; præscutum small. Legs very long; forefemora larger than the second pair, but not so conspicuously enlarged as in *schwarzii;* tibiæ much longer than femora. Wings narrow, three times as long as broad, narrowly angulate at apex, venation rather similar.

Genitalia.—Male.—Anal valve rather small, broad in caudal view, somewhat extended caudad in lateral view; forceps small, cultrate, inner edge rather sharp, only a little arched.

Described from one male from Athens, Georgia (J. C. Bradley), June 15, 1909.

Type in the collection of Cornell University.

RHINOPSYLLA JALAPENSIS Crawford.

Figs. 154, 155, 178, 376, 493.

Rhinopsylla jalapensis Crawford 11b:490.

Length of body 2.6 mm.; length of forewing 3.7; width of head 0.70. General color greenish brown.

Head not deflexed, scarcely as broad as thorax, arcuate on posterior margin; vertex with a deep sulcate depression on each side of median line extending obliquely toward outer margin of antennæ; anterior margin rather deeply cleft, but less so than in *athenæ;* anterior ocellus at apex of excision, visible from above; posterior ocelli situated well forward. Antennæ very long and slender, nearly as long as body, uniformly black; antennal bases swollen. Clypeus rather large; beak long and slender, acute.

Thorax arched, rather narrow, coarsely punctate. Præscutum long, rather narrow. Hind tibiæ with a small spur at base. Wings large, hyaline, acute at apex, about two and three-fourths times as long as broad; first marginal cell smaller than second.

Genitalia.—Male.—Genital segment large; forceps large, stout, obtuse at apex; anal valve long, spatulate; pubescence moderate. *Female.*—Genital segment almost as long as rest of abdomen, quite acute and slender; dorsal valve a little longer than ventral; pubescence rather sparse.

Described from several males and females from Jalapa, Mexico (Crawford), August 28, 1910.

Type in author's collection.

RHINOPSYLLA ANTENNATA Crawford.

Figs. 215, 333. 341.

Paratrioza antennata Crawford 10a:229.
Rhinopsylla antennata Crawford 11a:441; 11b:491.

Length of body 1.8 mm.; length of forewing 2.7; width of head 0.73. General color black, abdomen white ventrad; antennæ and tarsi lighter.

Head not deflexed, about as broad as thorax, broad posteriorly when viewed from the side, and tapering toward the insertion of the antennæ. Vertex arcuate on posterior margin, with a prominent sulcate depression extending forward and toward lower margin of eye on each side, rather deeply cleft in front; anterior ocellus at apex of excision, visible from above; genæ slightly swollen beneath antennal bases. Præscutum small. Legs not very long, as in preceding species. Wings hyaline, small, about two and a half times as long as broad, subacute apically; marginal cells subequal; venation light brown, inconspicuous.

Genitalia.—Male.—Genital segment small, not much larger than preceding segment; forceps small, subglobose basally, slender and acute apically; pubescence short and sparse. Anal valve about equal in size to ventral plate of segment, almost straight on inner margin, strongly arched posteriorly; pubescence longer than on genital plate and forceps.

Described from two males from Colorado (C. F. Baker), no data.

Type.—Cat. No. 18082, U. S. Nat. Mus.

RHINOPSYLLA ANTENNATA PROXIMA Crawford.

The chief variation from the species lies in the cephalic characters. The anterior emargination is less pronounced, and the basal segments of the antennæ are distinctly smaller, but of the same type. The sulcate depression on the vertex is more marked. The genal cones are entirely wanting, as in the other species of the genus, but the genæ are more globosely enlarged beneath the antennæ. The color is lighter in the varietal form, but this may be of no importance.

Described from one female collected in Colorado by C. F. Baker (no data).

Type in author's collection.

The varietal form approaches rather closely to species of *Kuwayama* (of Triozinæ) in the shape of the head, except for the anterior emargination, in which they are quite distinct from each other.

Subfamily CERIACREMINÆ.

This subfamily was created by Enderlein in 1910 ('**10**: 138) for a number of unrelated genera, some of which should be referred to Carsidarinæ and some to Psyllinæ. Two species only of the typical genus, *Ceriacremum*, are known in the New World fauna, and for these species Enderlein's subfamily name is retained. The limits of the subfamily, however, are very uncertain. The chief character upon which it stands is the presence in the forewing of one or more additional marginal cells, besides the usual two which are formed by the forking of the media and cubitus. The additional ones are formed either by the forking of the radial sector or by a cross vein between the latter and the medial vein.

This character is possessed by a dozen or more species, mostly tropical, but there are often wide differences between these species in other characters. It seems probable that this venational character, after further study of the tropical Psyllid fauna of the world, will prove to be valueless as a subfamily character. However, since only a few of these species are available for comparison at present, the most reasonable course to follow is to retain Enderlein's subfamily name for our two species, and to omit describing or designating the limits of the subfamily until more detailed study is possible. For the present, the description of the single New World genus, *Ceriacremum*, may suffice for the subfamily description.

Ceriacremum resembles members of Psyllinæ in cephalic and thoracic characters, having the frons completely covered by the genæ. *Phacopteron* Buckton ('**94**: 18) resembles *Ceriacremum* in venational characters, but differs widely in having the frons not covered by the genæ.

Anomoneura, a Japanese genus, is very anomalous in having the radial sector branched several times, thus forming several supernumerary marginal cells. In other respects it seems to be closely related to species of Psyllinæ.

Genus CERIACREMUM Enderlein.

Ceriacreumum Enderlein '10a: 138.
Panisopelma Enderlein '10b: 280.

Head rather large, not strongly deflexed; vertex broader than long, converging toward front; frons covered by genæ; genæ produced into cones of variable size. Antennæ long, slender. Hind tibiæ with a spur at base behind. Wings somewhat thickened, ovate, broadly rounded at apex, veins setigerous; radial sector branched apically and sending a short cross vein to media, thus making a third marginal cell.

Type of genus.—Ceriacremum filiverpatum Enderlein (an African species), designated by Enderlein (**'10**: 138).

SYNOPSIS OF SPECIES.

a^1. Genal cones very small; vertex twice as broad as long; antennæ half as long as forewing; length to tip of folded wings about 2 mm. .*quadrigibbiceps* Enderlein.
a^2. Genal cones two-thirds as long as vertex; vertex not quite twice as broad as long; antennæ as long as wings; length 3 mm to tip of folded wings
setosum, new species.

CERIACREMUM QUADRIGIBBICEPS Enderlein.

Panisopelma quadrigibbiceps Enderlein '10b:280.

The principal differences between this and the following species are mentioned in the foregoing synopsis. I have seen no specimens of this species.

Locality: Province of Mendoza, Pedregal, Argentina (Jensen-Harup), October 24, 1906 (one female).

Type in Stettin Zoological Museum.

CERIACREMUM SETOSUM, new species.

Figs. 37, 43, 220, 272, 278, 432.

Length of body 2.1 mm; length of forewing 2.1; width of head 0.91. General color brownish flavous. Body robust, quite large, finely and rather densely pubescent.

Head large, fully as broad as thorax, punctate, pubescent; vertex rather flat, with two slight depressions discally, scarcely elevated on postocellar regions, somewhat produced in front on each side of median line. Genal cones large, broad, continuing plane of vertex, almost horizontal, somewhat divergent, subacute at apex, pubescence very short.

Thorax arched, large, pubescent, punctate. Pronotum long, flat; mesopleurites extending forward almost to head. Præscutum long, broad, not as long as scutum. Hind tibiæ with a spur at base; all tibiæ with a conspicuous fringe of spines at apex. Wings large, broad, broadly rounded at apex, subhyaline, fumate in apical marginal area; about twice as long as broad; pterostigma large, long, darker than adjoining membrane, pubescent; first marginal cell very large; second marginal cell rectangular; all veins set biseriately with setæ, larger on basal and pterostigmal costa.

Genitalia.—Male.—Genital segment rather large; forceps relatively very large, directed cephalad, and as long as genital plate, with a dorsal vertical epiphysis; anal valve bi-dactylate; the lower dactyl staight, bidentate at tip; upper dactyl arcuate; base large. *Female.*—Genital segment rather small, acute at apex; dorsal valve distinctly larger and longer than ventral.

Described from three males and four females collected in Chinandega, Nicaragua, and Granada, Nicaragua, by C. F. Baker.

Type in author's collection.

Subfamily TRIOZINÆ.

Head more or less deflexed, seldom as broad as thorax; vertex usually subtriangular to semicircular in outline; genæ produced into conical or lobate processes, or sometimes only spherically swollen; frons covered by genæ, as in Psyllinæ, visible only as a minute sclerite bearing the front ocellus. Antennæ ten-segmented, variable in length. Eyes hemispherical. Thorax, typically, well arched; sclerites variable, as described for the genera. Hind tibiæ with three to four black spines at apex; basal tarsus of hind legs without claw-like spines present in Psyllinæ. Wings typically hyaline, elongate-ovate, more or less angulate at apex; cubital petiole (M+Cu) nearly always wanting, R, M and Cu arising together from the basal vein (see *Ceropsylla* and *Hemitrioza* for exceptions); pterostigma wanting.

The members of this subfamily bear a striking resemblance to species of *Psylla*, but differ sharply in several respects: The more slender body (usually), the absence of the "claws" on the basal tarsi of the hind legs, the differently shaped wings and the different venation of same. The presence or absence, and the number, of spines on the hind tibiæ and the basal tarsus of the hind legs seem to be very constant characters, although not heretofore used, and very valuable for classification.

SYNOPSIS OF GENERA.

a^1. Media and cubitus never with a petiole, the three veins (radius, media, and cubitus) arising at same point from basal vein.

  b^1. Genæ not produced into cones but more or less swollen spherically beneath base of antennæ . . . . *Kuwayama* Crawford.

b^2. Genæ produced more or less conically beneath antennæ.
  c^1. Pronotum long, flat, not at all depressed below level of præscutum and vertex, with an acute epiphysis in center of front margin, and a similar one on front margin of præscutum; notum nearly or quite flat; forewings nearly or quite three times as long as broad, often maculated.......*Leuronota*, new genus.
  c^2. Pronotum shorter, distinctly descending cephalad, depressed below head and præscutum; notum more strongly arched.
    d^1. Genal cones short and small; clypeus easily visible from front; vertex often conspicuously colored or banded...................*Paratrioza* Crawford.
    d^2. Genal cones at least moderately long, or not exceedingly short; clypeus not visible from front.
      e^1. Thorax broader than width of head including eyes; genal cones more or less divergent, variable in length, acute to subacute at apex. *Trioza* Förster.
      e^2. Thorax narrower than width of head, or not broader; genal cones long, slender, acute, closely appressed and not at all divergent; hind tibiæ with three apical spines within..................*Neotriozella* Crawford.

a^2. Media and cubitus with a short petiole, or showing a distinct tendency toward such a character, variable.
  b^1. Forewings elongate, nearly or fully three times as long as broad; R+M+Cu relatively long; M+Cu petiole short or subobsolete, rather constant within a species; hind tibiæ with two apical spines within........ *Ceropsylla* Riley.
  b^2. Forewings short, about twice as long as broad; M+Cu petiole variable within a species from long to obsolete (variable even on same individual); hind tibiæ with three apical spines within......................*Hemitrioza*, new genus.

Genus KUWAYAMA Crawford.

Epitrioza CRAWFORD (not Kuwayama) '11a: 452.
Kuwayama CRAWFORD '11b:

Head small, scarcely deflexed; notum rather flat, not arched; genæ not produced into cones, but swollen more or less spherically beneath bases of antennæ; clypeus large, easily visible from in front. Thorax as broad as, or broader than, head including eyes; pronotum usually not depressed below head and præscutum. Forewings subacute to acute at apex; venation as in *Trioza;* base of Cu relatively short.

Type of genus.—*Kuwayama medicaginis* Crawford.

This genus is rather closely related to *Paratrioza*, as shown especially by *K. dorsalis*. The form of the genæ, however, easily separates the two genera.

SYNOPSIS OF SPECIES.

a^1. Vertex rather deeply excised on each side of median line on top, margins not sharply differentiated; color of body light.
  b^1. Body small, wings less than 2.5 mm. long; antennæ scarcely twice as long as width of head; genital segment of female about half as long as rest of abdomen. *medicaginis* Crawford.
  b^2. Body larger, wings more than 3 mm. long; antennæ much more than twice as long as width of head; female genital segment nearly as long as rest of abdomen. *oaxacensis* Crawford.

a^2. Vertex not excised, almost flat, with margins sharply differentiated and giving vertex appearance of being raised plate-like. Color of body dark; forewings acute at apex; notum very flat........................*dorsalis*, new species.

KUWAYAMA MEDICAGINIS Crawford.

Figs. 204, 208, 346, 393, 537.

Paratrioza medicaginis CRAWFORD '10a:229.
Epitrioza medicaginis CRAWFORD '11a:452.

Length of body 1.7 mm.; length of forewing 2.6; width of head 0.68. General color yellowish-green throughout. Body small, slender.

Head scarcely deflexed, small, not quite as broad as thorax, somewhat punctate. Posterior margin of vertex arcuate; discal area with a distinct foveal depression on each side of median line; anterior margin somewhat emarginate at median line above front ocellus. Genæ swollen into two rather large globose lobes extending vertically downward, slightly visible from side, slightly pubescent. Clypeus large, prominent below genal lobes from in front.

Thorax small, not strongly arched, quite coarsely punctate; pronotum short; præscutum ascending, rather small. Wings small, hyaline, sometimes faintly coriaceous, less than three times as long as broad, subacute at apex; marginal cells subequal.

Genitalia.—*Male.*—Genital segment moderately large, rounded; forceps deeply divided, bilobate or bicuspidate; the posterior process longer than anterior, more acute and glabrous; remainder of forceps surface sparsely pubescent; anal valve rather large, broad at base, more slender distally and terminating in a uniformly tapering epiphysis, sparsely pubescent. *Female.*—Genital segment moderately large, both valves of almost equal length, rather acute at apex, sparsely pubescent.

Described from several males and females from Colorado (Cockerell), on alfalfa; El Centro, California (J. C. Bridwell), on the same plant, *Medicago sativa*. One female specimen from Jalapa, Mexico (Crawford), seems to represent a species close to *medicaginis*, or possibly identical, but until the male is known it had better remain undescribed.

Type in author's collection.

KUWAYAMA OAXACENSIS Crawford.

Figs. 211, 347, 540.

Epitrioza oaxacensis CRAWFORD '11a:453.

Length of body 1.9 mm.; length of forewing 3.3; width of head 0.70. General color light green with a tinge of yellow.

Head scarcely deflexed, small, punctate; vertex somewhat as in preceding species, but foveal depressions different in shape, arcuate on posterior margin and emarginate in front at median line. Genal lobes globose, very slightly angulated on inner margin, somewhat visible from side, sparsely pubescent. Clypeus visible from in front, rather large.

Thorax somewhat arched, broader than head including eyes, rather coarsely punctate. Præscutum longer than in preceding species, relatively narrower, rounded cephalad. Wings rather large, hyaline about two and a half times as long as broad, rounded apically or very broadly angulate; marginal cells subequal; one specimen presents the anomaly of the furcation distally of the radial sector of both primary wings.

Genitalia.—Female.—Genital segment long, slender, about as long as rest of abdomen; dorsal valve slightly longer than ventral, equally acute but less slender; pubescence sparse and short.

Described from four females from Oaxaca, Mexico (Crawford), August 10, 1910.

Type specimen in author's collection.

KUWAYAMA DORSALIS, new species.

Fig. 415.

Length of body 1.8 mm.; length of forewing 2.9; width of head 0.70. General color chocolate brown on dorsal surface of head, thorax, and abdomen; lighter on pleural and ventral regions and on legs; dorsal surface smooth.

Head almost as broad as thorax, not deflexed; vertex about twice as broad as long, with a foveal depression near posterior margin on each side of median line, anterior and lateral margins sharply defined, somewhat elevated. Genæ subspherically swollen beneath antennal bases. Clypeus large. (Flagellum of antennæ broken off.)

Thorax only a little arched; pronotum very short; præscutum ascending, long. Forewings hyaline, acute at apex, more than two and a half times as long as broad; marginal cells small; radial sector short.

Genitalia.—Male.—Genitalia small; forceps slender, almost as long as anal valve, acute at apex; viewed from behind, with apical half much narrower, flattened laterally, basal portion thick with a small inner process. Anal valve with a large posterior lobe, reaching nearly to base of forceps.

Described from one male from Tucson, Arizona (H. G. Hubbard), December.

Type.—Cat. No. 18080, U. S. Nat. Mus.

In some respects this species seems to be closely related to members of *Paratrioza.*

LEURONOTA, new genus.

Head not as broad as thorax, scarcely deflexed; notum almost flat, scarcely arched; genal processes conical, divergent. Antennæ more than twice as long as width of head, slender. Pronotum long, flat, not descending cephalad, produced in the center of the anterior margin into an acute epiphysis, on same level with præscutum and vertex. Præscutum rather flat, with an epiphysis corresponding to that of pronotum. Forewings long and slender, nearly or quite three times as long as broad, more or less acute at apex, often maculated. Hind tibiæ with two apical spines on inside.

Type of genus.—*Leuronota maculata* Crawford.

This genus is erected to include two of the species formerly placed in *Allotrioza*, now in synonymy. The character of the pronotum is still used somewhat as it was in *Allotrioza*, but it is more restricted and more sharply differentiated from the usual type in *Trioza*.

SYNOPSIS OF SPECIES.

a^1. Forewings conspicuously maculated, fully three times as long as broad.
    b^1. Genal cones descending; vertex with a deep fovea on each side of median line; dorsum slightly arched; wings three times as long as broad.
        maculata Crawford.
    b^2. Genal cones extending forward in same plane with vertex; vertex almost flat; dorsum scarcely arched; wings more than three times as long as broad, very narrow.......................................*longipennis*, new species.
a^2. Forewings not, or indistinctly, maculated, slightly less than three times as long as broad; genal cones descending.......................*acutipennis* Crawford.

LEURONOTA MACULATA Crawford.

Figs. 180, 181, 352, 510.

Trioza maculata CRAWFORD '10b: 349.
Allotrioza maculata CRAWFORD '11a: 446.

Length of body 2.3 mm.; length of forewing 3.1. General color greenish white to light brown; abdomen dorsally dark brown, ventrally mottled with brown; forewings maculated with brown.

Head not quite as broad as thorax, finely punctate; vertex emarginate on posterior margin in front of pronotal epiphysis, with a prominent foveal depression on each side of median line; genal cones not quite as long as vertex, descending somewhat, abruptly smaller and more divergent in apical half, subacute at apex, pubescent. Clypeus moderately large, visible from in front. Antennæ about two and a half times as long as width of head, slender; segments tipped with brown, apical segment entirely brown.

Thorax only slightly arched, more coarsely punctate than head. Pronotum one-third as long as præscutum, anterior epiphysis conspicuous; pleurites large; præscutum slightly broader than long, as long as scutum, with a short epiphysis on anterior margin in center; scutum with three indistinct stripes. Legs slender. Wings hyaline, three times as long as broad, subacute at apex, with a large brown macula covering most of posterior apical half and often extending to basal half; radial sector short; first marginal cell larger than second.

Genitalia.—*Male.*—Genital segment moderately large; anal valve large, simple, fusiform in lateral aspect, much longer than forceps, pubescent; forceps broadest at base, curved forward, acute at apex and tapering thereto from base. *Female.*—Genital segment nearly half as long as rest of abdomen, roundly acute at apex, thick dorsoventrally, pubescent, dorsal valve slightly longer than ventral.

Described from 19 males and females from: San Diego, Texas (Jones and Pratt), on *Condalia obovata*, March 25, 1908; Rockport, Texas (Schwarz), on *Columbrina texana*, August; Wades, Texas (Schwarz), May; Brownsville, Texas (Schwarz), June; Hot Springs, Arizona (Barber and Schwarz), June; Arizona (Baker).

Type in author's collection.

LEURONOTA ACUTIPENNIS Crawford.

Figs. 186, 512.

Trioza acutipennis CRAWFORD '10b:350.
Allotrioza acutipennis CRAWFORD '11a:446.
Trioza crawfordi AULMANN '13:44.

Length of body 2.7 mm.; length of forewing 3.5; width of head 0.72. General color yellowish brown; scutum with five brownish stripes.

Head almost as broad as thorax, finely rugoso-punctate; vertex emarginate on posterior margin, as in *maculata*, with a foveal depression on each side of median line. Genal cones not quite as long as vertex, descending somewhat, divergent, subacute, sparsely pubescent. (Antennæ destroyed.)

Thorax slightly arched, more coarsely rugulose than head. Pronotum one-third as long as præscutum, anterior epiphysis conspicuous, lateral foveæ black; pleurites large; præscutum longer than in *maculata*, about as long as broad, with a conspicuous epiphysis in middle of front margin fitting into an emargination on hind margin of pronotum. Wings hyaline, about two and four-fifths times as long as broad, acute at apex, with several very light brown and indistinct maculæ, one in inner basal cell beside Cu_2, another extending through first marginal cell to M, a third at tip of wing in second marginal cell; radial sector longer than media.

Genitalia.—Male.—Genital segment one-fourth as long as rest of abdomen; forceps bilobate, with a projecting lobe extending posteriorly; anal valve and forceps thickly pubescent.

Described from one male collected at Chinandega, Nicaragua (C. F. Baker). The abdomen has been broken off since the original description of the species.

Type specimen in author's collection.

LEURONOTA LONGIPENNIS, new species.

Figs. 141, 405.

Length of body 2.8 mm; length of forewing 3.1; width of head 0.68. General color brown; genal cones, anterior margin of pronotum, part of sternum, legs, antennæ except terminal segment very light brown; antennal segments tipped with brown.

Head small, flattened, not deflexed, not as broad as thorax; vertex flat, with a broad, shallow depression on each side of median line, smooth; genal cones about two-thirds as long as vertex, extending forward in same plane with vertex, divergent, subacute at apex, slightly pubescent. Clypeus far back, with a conspicuous cavity in front of it between genæ. Antennæ more than three times as long as width of head, slender.

Thorax not arched, flat, narrow; pronotum moderately long, anterior epiphysis smaller than in two preceding species. Legs slender. Wings nearly four times as long as broad, very narrow, narrowly rounded at apex, apical third brown, basal two-thirds transparent, membrane coarsely punctate; first marginal cell larger than second; radial sector long.

Genitalia.—Male.—Genital segment small; anal valve much longer than forceps, fusiform, narrow at apex, with processes; forceps small, short, slender, acute at tip, strongly arcuate; pubescence short.

Described from one male from Palm Beach, Florida (H. G. Dyar), no data.

Type.—Cat. No. 18081, U. S. Nat. Mus.

This species bears some resemblance to members of the European genus *Floria*.

Genus PARATRIOZA Crawford.

Head more or less deflexed; vertex distinctly raised plate-like, with margins sharply defined, sometimes briefly pubescent, and sometimes variegated in color (as in *cockerelli*); genal cones short, often very short, acute, directed forward and outward; anterior ocellus best visible from in front, beneath slightly overhanging vertex. Antennæ slender. Clypeus large, easily visible from in front. Dorsum of thorax not strongly arched. Wings membranous, usually more than two and a half times as long as broad. Hind tibiæ with two apical spines on inner side, and sometimes a spur at base.

Type of genus.—*Paratrioza cockerelli* Sulc.

SYNOPSIS OF SPECIES.

a^1. Wings maculated, acute at apex; radial sector short and straight; second marginal cell much smaller than first; vertex and notum not conspicuously striped and banded... *maculipennis* Crawford.

a^2. Wings not maculated, subacute at apex; Rs long and curved.

  b^1. Body large; length to tip of folded wings at least 4 mm; vertex and notum not or only slightly variegated; hind tibiæ with large spines at apex and a small spur at base; wings large; first marginal cell larger than second. *arbolensis* Crawford.

  b^2. Body small; length to tip of wings only 3 mm; vertex and notum very conspicuously striped and banded with white or yellow; hind tibiæ with small apical spines and no basal spur; wings small, marginal cells subequal. *cockerelli* Sulc.

PARATRIOZA COCKERELLI Sulc.

Figs. 211, 330, 331, 348, 535, 536.

Trioza cockerelli Sulc '09a: 102-108.
Paratrioza cockerelli Crawford '11a: 448; Patch '12: 321.
Paratrioza pulchella Crawford '10a: 229.
P. ocellata Crawford '11a: 447.
The Tomato Psyllid, Johnson '11: (?).

Length of body, average, 1.4 mm; length of forewing 2.7; width of head 0.52 to 0.70. General color light to dark brown (to unaided eye); head and thorax conspicuously striped and banded with white or yellow; vertex black, with a whitish or yellow band bordering it, and a white to yellow crescentic macula in center of discal area of variable size; pronotum white to yellow on posterior side; præscutum with a white stripe along median dorsal line and a horse-shoe-shaped band laterad; scutum with a stripe on each side of median dorsal line and an arcuate band laterad; pleuræ more or less variegated, legs and antennæ brown.

Head deflexed, nearly as broad as thorax, finely punctate; margins of vertex distinctly raised and sharply defined; discal impressions small. Genal cones very small, acute, divergent, projecting forward or slightly outward, seldom downward, pubescent. Antennæ not over twice as long as width of head, slender, with a peculiar sense organ on segment IV. Clypeus large.

Thorax arched, punctate. Pronotum descending cephalad below posterior margin of vertex. Praescutum roundly acute cephalad. Wings small, hyaline, about two and three-fourths times as long as broad, subacute at apex; Rs moderately long, flexed subapically; M and Cu long; marginal cells subequal.

Genitalia.—*Male.*—Genital segment rather small; forceps relatively long, somewhat scythe-shaped when viewed either from side or rear; anal valve reaching higher than forceps, produced posteriorly on each side into a lobe which varies in size and shape from long and slender to very broad at base and triangular in shape. *Female.*—Genital segment very short and small, subacute; dorsal valve about as long as preceding tergite; anal pore large; pubescence sparse.

Described from numerous males and females from the following localities: Boulder, Colorado (Cockerell), on pepper (*Capsicum annuum*), topotypes; Rocky Ford, Colorado (McMillan), on tomato (*Solanum nigrum*), September, 1910; Cañon City, Colorado (Gravestock), on tomatoes, October, 1894; Colorado (Gillette, Baker), no data given; Park City, Utah (Hubbard and Schwarz); Milford, Utah (J. C. Bradley), September, 1908; Williams, Arizona (Barber and Schwarz), on *Purshia* and Arbor-vitæ, May and July; Tucson, Arizona (Hubbard), December; Fort Yuma, Arizona (Hubbard), January; Madagascar Mountains, New Mexico (Snow), August, 1894;

Claremont, California, Mountains (Crawford), on a species of Spruce, June, 1911, found in myriads infesting the twigs and needles; El Centro, California (J. C. Bridwell), on alfalfa; San Luis Obispo, California (Condit), on "green-house tomatoes," September, 1909; Argus Mountains, on *Pinus monophylla*, and Death Valley, California (Koebele), May; Alameda, California (Koebele), September.

Food plants: Pepper (*Capsicum annuum*), tomato (*Solanum nigrum*), potato (*Solanum tuberosum*), *Purshia* sp., arbor-vitæ (*Thuja occidentalis*), spruce (*Picea* sp.), pine (*Pinus monophylla*), alfalfa (*Medicago sativa*). Some of these plants may not be true food plants. This is a species easily distinguished from all others by the striking coloration of the body. Its distribution seems to be general throughout the southwestern United States and is often found in great numbers, sometimes becoming a pest to cultivated plants. Since describing *P. ocellata* (Crawford **'11a**: 447) as a new species closely related to *cockerelli*, I have had an opportunity to examine many more specimens from many localities, and have come to the conclusion that all these represent but one species more or less variable in some respects. The variation in degree of coloration is so marked and continuous that it seems useless to try to distinguish the varietal forms *nigra* and *flava*.

PARATRIOZA ARBOLENSIS Crawford.

Figs. 197, 200, 207, 345, 391, 532.

Paratrioza arbolensis CRAWFORD **'10a**:229.
Allotrioza arbolensis CRAWFORD **'11a**:444.—PATCH **'12**:231.

Length of body 2.6 mm; length of forewing 3.9; width of head 0.96. General color light green throughout. Body very large.

Head a little deflexed, very large, punctate; vertex arcuate on posterior margin, front margin sharply defined, with a deep fovea on each side of median line discally and a marked depression diverging toward insertion of antennæ with a prominent elevation on each side of median line between depressions. Eyes very large. Genal cones short, horizontal. Extending outward, subacute at apex, moderately pubescent. Antennæ large basally. Clypeus very large, easily visible from in front.

Thorax large and broad, slightly broader than head including eyes, more coarsely punctate than vertex. Pronotum rather long, somewhat depressed below head and præscutum; latter long and broad, rather triangular, narrow cephalad. Legs large; hind tibiæ with large spines at apex and a distinct spur at base; claws large. Wings hyaline, large, straight on hind margin, front margin arched, not quite three times as long as broad.

Genitalia.—*Male.*—Forceps rather large at base, subacute at apex; anal valve small, simple. *Female.*—Genital segment rather small, scarcely longer than two preceding ventral sclerites; dorsal valve longer than ventral, acutely pointed; ventral valve acute; pubescence sparse.

Described from three males and four females from Arboles, Colorado (C. F. Baker), on *Shepherdia* sp.

Type in author's collection.

In the preliminary synopsis of Triozinæ (Crawford '**10a**: 229) this species was included in the genus *Paratrioza*. In a later paper it was removed and made the type of a new genus on the basis, principally, of the larger pronotum. After further study, it seems that this species is not distinct generically, and therefore it is returned to *Paratrioza*, and *Allotrioza* is sunk into synonymy. The other species of the latter genus are placed in other genera.

PARATRIOZA MACULIPENNIS Crawford.

Fig. 302.

Trioza maculipennis CRAWFORD '**10a**: 237.
Paratrioza maculipennis CRAWFORD '**11a**: 450.

Length of body 1.7 mm; length of forewing 2.85; width of head 0.77. General color reddish brown to dark brown or black; vertex fulvous brown, margin and discal area usually lighter; thorax darker, somewhat mottled; notum more or less striped; abdomen dark; antennæ black at tip, intermediate segments tipped with black.

Head deflexed, almost as broad as thorax; vertex flat, with a shallow depression on each side of median line, pubescent; genal cones short, longer than in *cockerelli*, directed forward and outward, acute, pubescent. Antennæ fully twice as long as width of head, slender.

Thorax not strongly arched, coarsely punctate, slightly pubescent. Pronotum rather short, descending cephalad; præscutum broader than long. Legs moderately long; apical spines on hind tibiæ rather large; basal spur small or wanting. Wings acute at apex, posterior margin somewhat angled, front margin strongly arched, about two and two-thirds times as long as broad, with several brown maculæ in apical half covering both marginal cells and parts of other cells; Rs short and straight; first marginal cell distinctly larger than second.

Genitalia.—*Male.*—Anal valve relatively large, with a long posterior process reaching over forceps, somewhat as in *cockerelli;* forceps small, short, acute at apex. *Female.*—Genital segment short, about as long as preceding ventral sclerite, subacute at apex, dorsal valve a little longer than ventral.

Described from two males from San Mateo County, California (C. F. Baker), and 17 males and females from the following localities: Sacramento, California (A. Koebele), on *Convolvulus occidentalis*, July; Folsom, California (Koebele), on same host, August; Ukiah (?), California (I. J. Condit), on *Convolvulus arvensis*, September; Placer County, California (Koebele), on *Ceanothus cordulatus*, September; Stanford University, California (Crawford), on *Salix* sp., February (probably only migrants).

Type in author's collection.

Genus TRIOZA Förster.

Head not broader than thorax, usually distinctly narrower, deflexed; vertex much broader than long, with more or less of an emargination in front between the two lobes; genal cones variable in length, shape, and trend, usually subacute, always more or less divergent. Clypeus subglobose or pyriform, scarcely visible from in front. Eyes large, hemispherical. Antennæ slender, from one to two and a half times as long as width of head.

Thorax usually arched rather strongly; pronotum short, descending cephalad quite strongly, depressed below level of head and præscutum; propleurites as in *Psylla;* epimeron usually shorter than episternum; pleural suture oblique, not extending to middle of lateral extremity of pronotum, as is the case in *Aphalara*. Præscutum usually about as long as broad, narrowed conspicuously cephalad. Legs usually slender; hind tibiæ with two or three black spines at apex on inner side and one outside. Wings hyaline, membranous; radius, media, and cubitus diverging at same point from basal vein (R+M+Cu), and cubital petiole (M+Cu) wanting.

Type of genus.—Trioza urticæ Linnæus. Apparently no species has yet been designated as the type of this genus. Because *urticæ* is both typical and one of the first known species, it is here designated as the type.

This is a very large genus and many of its species are difficult to distinguish, as is usually the case in large genera. The same is true of *Psylla* and *Aphalara*. Under this generic name there have been described a number of species which differ sufficiently to warrant the erection of other genera for them. The synopsis of species presented in a former paper (Crawford **'11a**) has been entirely made over and is now much more usable than before. All the species described from America have been included so far as possible, so that it is also much more complete than before.

Descriptions of the genus, as formerly defined, may be found in Scott **'76**:551, and Froggatt **'01**:273. Synopses of genera, including *Trioza*, have appeared in several papers, as in Loew **'78**:609; Maskell **'89**:164; Crawford **'11a**:423. The genus is redefined here, however, and the descriptions of both genus and species are based on some characters not heretofore used.

SYNOPSIS OF SPECIES.

a^1. Posterior tibiæ with three black spines on inner side, and one outside; pronotum usually long.

b^1. Antennæ not longer than width of head; body large, robust; wings large.

c^1. Vertex and notum with short pubescence; vertex light colored, rather flat, not coarsely punctate... *bakeri* Crawford.

c^2. Vertex and notum not pubescent; vertex black, bulging lobately in front, very coarsely punctate............................... *breviantennata*, new species.

b^2. Antennæ distinctly longer than width of head, seldom more than twice as long.

c^1. Vertex and thoracic dorsum more or less pubescent.

d^1. Pubescence long, prominent; wing veins without setæ; membrane of wings transparent; second marginal cell unusually large; genal cones about half as long as vertex.. *diospyri* Ashmead.

d^2. Pubescence very short; wing veins with conspicuous setæ; membrane darkened by numerous punctural dots; second marginal cell not unusually large; genal cones as long as vertex.

e^1. Body large; wings smoky or fulvous; setæ on veins prominent. *mexicana* Crawford.

e^2. Body rather small; wings only slightly fulvous; setæ not prominent. *mexicana minuta* Crawford.

c^2. Dorsum of thorax not pubescent.

d^1. Genal cones not or scarcely more than half as long as vertex, not strongly divergent; female genital segment very elongate and styliform.

e^1. Female genital segment three-fourths as long as rest of body; styliform prolongation more than twice as long as basal portion; posterior margin of male anal valve angulate; antennæ twice width of head. *proximata* Crawford.

e^2. Female genital segment not over half as long as rest of body; styliform prolongation one to one and a half times as long as basal portion; posterior margin of male anal valve arcuately rounded; antennæ less than twice width of head.

f^1. Clypeus very large; styliform prolongation of female genital segment usually much longer than basal portion; genal cones bluntly rounded... *longistylus* Crawford.

f^2. Clypeus not large; styliform prolongation of female genital segment usually not longer than basal portion (sometimes longer); genal cones acute at apex.................................... *collaris* Crawford.

d^2. Genal cones more than half as long as vertex, more divergent; female genital segment not styliform.

e^1. Forewing with four brown maculæ on posterior margin; costal margin strongly arched; Rs short; genal cones rather short, scarcely two-thirds as long as vertex............................. *quadripunctata* Crawford.

e^2. Forewings without four such maculæ; genal cones at least two-thirds as long as vertex.

f^1. Antennæ nearly or quite twice as long as width of head; forewings broadly rounded at apex; Rs short, straight; legs very slender; genal cones about two-thirds as long as vertex; hind tibiæ occasionally with only two spines at apex inside.................... *albifrons* Crawford.

f^2. Antennæ not over one and a half times width of head; wings not broadly rounded; Rs longer; genal cones often as long as vertex; legs not always slender.

g^1. Antennæ one and a half times width of head; vertex not or scarcely pubescent; posterior lobe of male anal valve large (fig. 358).

$h.^1$ Body brownish red to orange; thorax strongly arched; dorsum not pubescent................................. *frontalis* Crawford.

h^2. Body dark reddish brown; thorax less strongly arched; dorsum with slight and inconspicuous pubescence.
frontalis sulcata Crawford.

g^2. Antennæ one and one-fourth times width of head; vertex distinctly pubescent; posterior lobe of male anal valve smaller, more slender.
obtusa Patch.

a^2. Posterior tibiæ with two black spines on inner side and one outside; pronotum usually shorter.

b^1. Forewings more or less maculated or banded.

c^1. Notum distinctly pubescent; maculation of wings very extensive and conspicuous...*lobata*, new species.

c^2. Notum not pubescent; maculation much less extensive.

d^1. Media and cubitus bordered with a dark band; marginal cells darkened; Rs long and curved; female genital segment rather long; anal valve of male obtriangular..*tripunctata* Fitch.

d^2. Posterior margin darkened from tip of clavus to tip of wing and through both marginal cells; Rs short, straight; female genital segment short; male anal valve small, with a rectangular posterior lobe.
arizonæ Aulmann.

b^2. Forewings not maculated or banded.

c^1. Præscutum not distinctly longer than broad.

d^1. Antennæ not over twice as long as width of head.

e^1. Genal cones usually fully or very nearly as long as vertex (sometimes scarcely over two-thirds as long), divergent, acute to subacute; Rs long and curved.

f^1. Forewings very broadly rounded at apex; thorax and vertex often more or less conspicuously striped or banded with yellowish white on a dark ground color...............................*varians* Crawford.

f^2. Forewings more or less angulate at apex, not broadly rounded; thorax and vertex not as above.

g^1. Vertex conspicuously bulging forward; male anal valve with posterior lobes short; female genital segment usually moderately long, sometimes short...*salicis* Mally.

g^2. Vertex not conspicuously bulging forward; female genital segment very short, not longer than preceding ventral sclerite; genal cones not very slender; forewings usually (not always) fulvous; vertex without deep sulcus...........................*maura* Förster.

e^2. Genal cones not over two-thirds as long as vertex, or less.

f^1. Forewings short, seldom over 2.5 mm. long; body small.

g^1. Genital segment of female short, less than half as long as rest of abdomen; genal cones short, about half as long as vertex.
salicis Mally.

g^2. Genital segment of female nearly or fully as long as rest of abdomen; genal cones two-thirds as long as vertex.

h^1. Female genital segment with a short styliform prolongation, very acute; clypeus small...................*nicaraguensis* Crawford.

h^2. Female genital segment without styliform prolongation; dorsal valve longer than ventral, acute; wings sometimes 2.8 mm. long; male forceps enlarged and hood-shaped at apex..*stylifera* Patch.

f^2. Forewings more than 2.5 mm. long, usually at least 3 mm.; body larger. (See *stylifera*.)

g^1. Wings broadly rounded at apex; antennæ about one and a half times width of head.

h^1. Male anal valve with a long posterior lobate prolongation with long hairs; forceps large, clavate at tip..............*aylmeriæ* Patch.

h^2. Anal valve without long posterior lobe but posterior margin arcuately rounded caudad; forceps strongly arched laterally; vertex bulging in front; hind tibiæ usually with three apical spines inside................................*albifrons* Crawford.

g^2. Wings angulate at apex, sometimes broadly so.

h^1. Female genital segment more than half as long as rest of abdomen; antennæ about one and one-third times width of head; wings rather narrowly acute at apex....................*alacris* Flor.

h^2. Female genital segment less than half as long as rest of abdomen; antennæ about one and a half times width of head; wings rather broadly acute at apex...........................*salicis* Mally.

d^2. Antennæ about two and a half times as long as width of head; body and wings small; pronotum rather long; apical spines on hind tibiæ very small..*viridis* Crawford.

c^2. Præscutum distinctly longer than broad; body large; gall-makers.

d^1. Antennæ twice as long as width of head; head nearly or fully as broad as thorax. Galls on leaves of *Magnolia;* nymph not pubescent. *magnoliæ* Ashmead.

d^2. Antennæ about one and a half times width of head; head usually much narrower than thorax. Galls on leaves of *Persea* (avocado or aguacate); nymph pubescent...................................*koebelei* Kirkaldy.

TRIOZA BAKERI Crawford.

Trioza bakeri CRAWFORD '10a:235.
Trioza montana CRAWFORD '11c:631.

Length of body 2.2 mm.; length of forewing 3.5. General color brown, light to dark; dorsum and abdomen sometimes darker; antennæ black at tip. Vertex and notum covered with fine short pubescence. Body large.

Head somewhat deflexed, almost as broad as thorax, large; vertex more than half as long as broad, pubescent, each lobe rounded broadly in front, with a foveal impression posteriorly on each side of median line; genal cones about two-thirds as long as vertex, divergent, acute to subacute, not much deflexed from plane of vertex. Antennæ scarcely longer than width of head, a little thicker relatively than in most species of the genus.

Thorax broad, arched, punctate, pubescent and slightly pulverulent. Pronotum long, not as conspicuously descending cephalad as usual. Hind tibiæ with three inner apical spines. Wings large, two and two-thirds times as long as broad, acute to subacute at apex; Rs very long, reaching nearly to apex of wing.

Genitalia.—Male.—Anal valve triangular in profile, with base broad and apex roundly acute, slightly longer than forceps; forceps thick, flattened, somewhat arcuate, apex not acute. *Female.*—Genital segment large, nearly as long as rest of abdomen; valves about equal in length, pubescent.

Described from one pair from Claremont, California (C. F. Baker); eight males and females from the mountains of the same locality (Crawford), collected in June on the foliage of *Pinus ponderosa,* white fir (*Abies* sp.), and a species of spruce (these latter were described as *T. montana* Crawford); seven specimens from Placer and Nevada Counties, California (Koebele), September. The latter specimens bear the manuscript name of *Trioza puberula* Riley.

Type in author's collection.

TRIOZA BREVIANTENNATA, new species.

Figs. 394, 396, 422.

Very similar in size and general proportions to *T. bakeri;* wings relatively a little shorter. General color light to dark brown, often very dark; legs and antennæ lighter, except latter black at tip; in light forms the vertex is dark brown to black. Vertex and dorsum not pubescent as in *bakeri*, but very coarsely punctate.

Similar in many respects to *bakeri*, but vertex very conspicuously bulging on each side of median line; genal cones relatively shorter; antennæ a little shorter, scarcely as long as width of head. Thorax as in *bakeri*, but not pubescent. Hind tibiæ with three apical spines within. Wings large, resembling *bakeri*.

Genitalia.—*Male.*—Anal valve as in *bakeri*, but base of triangle shorter; forceps similar, subacute at apex, sides almost parallel. *Female.*—Genital segment similar, but dorsal valve a little longer than ventral.

Described from two males and one female from Claremont, California (mountains), collected by C. F. Baker, no data with them.

Type in author's collection.

TRIOZA DIOSPYRI Ashmead.

Figs. 179, 356, 360, 519.

Psylla diospyri Ashmead '81: 222.
Trioza diospyri Riley '83: 70.—Crawford '10b: 352.—Patch '12b: 226.
Trioza latipennis Crawford '10a: 230.

Length of body 2.5 mm; length of forewing 4.4; width of head 0.79. General color shining black; middle and hind tibiæ and all tarsi whitish; pubescence long and sparse, conspicuous.

Head nearly as broad as thorax; vertex more than half as long as broad, emarginate in front at median line, with a broad shallow depression on each side discally; genal cones about half as long as vertex, subhorizontal, not strongly divergent, broadly rounded at apex, very densely hirsute. Antennæ about one and a third to one and a half times width of head, whitish except black at tip, clothed very sparsely with long hairs.

Thorax rather strongly arched, smooth and shining; pronotum short, much depressed below head and præscutum; latter narrowly rounded cephalad. Legs rather long, thickly pubescent; anterior metacoxal spur unusually long; hind tibiæ with three apical spines within. Wings much longer than body, very large, apex acute to subacute, about two and a half times as long as broad; Rs about as long as M to furcation point; second marginal cell unusually large. Hind wings relatively very small.

Genitalia.—Male.—Anal valve with a large, lobate, posterior prolongation; anus on a slender dorsal epiphysis; forceps long, somewhat cultrate in form, erect on basal two-thirds, apex flexed inward, not acute. *Female.*—Genital segment about half as long as rest of abdomen; dorsal valve a little longer than ventral, acute.

Described from more than 100 specimens of both sexes from the following localities: West Falls Church, Virginia (Nathan Banks); Clayton, Georgia (J. C. Bradley), May 18, 1911, altitude 2,000 feet; Burton, Georgia (Bradley), May 21, 1911, altitude 1,800 feet; Atlanta, Georgia (Bradley), June 30, 1909; Athens, Georgia (Bradley), June 15, 1909; Austell, Georgia, August 27, 1910; Savannah, Georgia (Schwarz), April 15, 1884; Thalmon, Georgia, April 28, 1911; Billys Island, Okefenoke Swamp, Georgia, June, 1912; Crescent City, Florida (Hubbard), May 23, on persimmons; Tampa, Florida (E. P. Van Duzee), May 2, 1908; San Antonio, Texas (E. A. Schwarz), May 9, 1907; Devils River, Texas (F. C. Bishopp), May 5, 1907; San Diego, Texas (Schwarz), April 29. No host plant data accompanies any of these specimens except the two taken on persimmons in Florida. This is said to be a very common species on persimmons, *Diospyros virginiana*, throughout the southern portion of the country. W. H. Ashmead's account of the life history of the species is given as follows (Ashmead '81:221–223):

> In the summer of 1879 I noticed for the first time that the leaves of the persimmon trees, *Diospyros virginiana*, in the vicinity of Jacksonville, Florida, were very much discolored, curled and distorted; on most of them, too, were numerous small, warty galls. A thorough examination under the curled and twisted parts of the leaves revealed numerous small, flattened hemipterous bugs, arranged in rows and covered with a fine mealy or powdery substance; on being disturbed they secrete large watery globules, the color of milky water. A careful study of these during the past two years has enabled me to completely work out their life history.
>
> By the middle of April they are found in considerable numbers on the young leaves * * *. At this time, also, they are caught copulating, soon after which the female begins depositing her eggs. These are very minute, 0.01 of an inch in length, elongate-ovate, pale greenish in color, with a wavy filament beneath at the thick end, nearly the length of the egg, extending backward over it. These are laid along the margin of the leaf without regard to regularity, the female first preparing for their reception by secreting a threadlike gummy, transparent substance along the extreme edge of the leaf; she then fastens them in place by the beak, which adheres securely to the gummy substance.
>
> The eggs hatch in from five to six days (actual observation) and the leaf from their punctures curls completely over them. Under this they reside until just before their transformation (last). The pupa then comes forth, attaches itself to a twig or leaf, and changes into the perfect fly, escaping through a longitudinal slit in the head

and thorax. The young take from four to five weeks to mature, and breed throughout the summer.

The fall brood probably lay their eggs in the crevices of the bark and twigs. These hatch at the first appearance of spring and feed on the tender new shoots and leaves, and are those found fully matured by the first or second week in April.

The larva is fringed on the margins with long hairs, as in other species of *Trioza*.

TRIOZA MEXICANA Crawford.

Figs. 210, 340, 389, 531.

Trioza mexicana CRAWFORD '11a:439.

Length of body (female) 2.6 mm; length of forewing 3.6; width of head 0.87. General color reddish brown, usually dark, occasionally lighter; head lighter than thorax; antennæ whitish on basal third, remainder black. Vertex and notum slightly pubescent.

Head not as broad as thorax; vertex more than half as long as broad, with a very shallow depression on each side of median line, rounded down in front toward genal cones; cones nearly or fully as long as vertex, rather slender, acute, not very divergent. Antennæ about one and a half times as long as width of head, slender.

Thorax strongly arched, punctate, pubescent slightly. Pronotum long. Hind tibiæ with three apical spines within. Wings dusky, membrane covered entirely with fine punctural dots; veins set with a double row of setæ; less than two and a half times as long as broad, broadly rounded at apex.

Genitalia.—*Male.*—Anal valve large, long, front margin straight, hind margin very arcuately rounded caudad, apex short; forceps long, sides subparallel except subapically, apex abruptly broadened, black. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve longer than ventral, both slender and acuminate in apical portion, margin slightly serrate.

Described from several males and females collected on a species of *Rhus* in the mountains near Cuernavaca, Mexico, altitude 10,000 feet (Crawford).

Type in author's collection.

TRIOZA MEXICANA MINUTA Crawford.

Body distinctly smaller than in the species. Head similar. Pronotum comparatively shorter. Wings smaller, less dusky; setæ on veins smaller and less prominent; venational characters similar. Genitalia similar, smaller in male.

Described from three females and one male from Oaxaca, Mexico (Crawford), no other data.

Type in author's collection.

TRIOZA PROXIMATA Crawford.

Figs. 388, 529.

Trioza proximata CRAWFORD '11a:435.

Length of body (female) 3.4 mm; (male) 2.4; length of forewing 3.7; width of head 0.78. General color light greenish yellow; ovipositor of female black; antennæ black apically.

Head small, much narrower than thorax; vertex a little more than half as long as broad, somewhat bulging in front on each side of median line, with a deep foveal impression posteriorly on each side; genal cones short, half as long as vertex, only slightly divergent, subacute, pubescent. Antennæ about twice as long as width of head.

Thorax large, broad, strongly arched, punctate; pronotum rather short, strongly descending cephalad; propleurites broad. Præscutum very narrowly rounded cephalad. Mesonotum long. Hind tibiæ with three apical spines within. Wings about two and a half times as long as broad, broadly rounded at apex; Rs very olong.

Genitalia.—*Male.*—Genital segment large. Anal valve about as long as forceps, triangular in outline, posterior margin angulately arcuate, anus on an epiphysis; forceps long, curved cephalad, and arcuate toward each other, rather slender, acutely pointed at apex, with two ridges of hairs on inner surface. Penis long. *Female.*—Genital segment very elongate and styliform except at base, nearly three-fourths as long as rest of body; base large, subglobose; apical two-thirds styliform, very slender and acuminate, dorsal valve longer than ventral. Pubescence short.

Described from several males and females from Oaxaca and Orizaba, Mexico (Crawford), August, 1910. No host plant data.

Type in author's collection.

TRIOZA COLLARIS Crawford.

Figs. 185, 187, 350, 509.

Trioza collaris CRAWFORD '10b:347; '11a:436.—PATCH '12b:225.

Length of body (female) 2.5 mm; length of forewing 3.7; width of head 0.72. General color greenish yellow; notum more or less streaked with brown; abdomen darker dorsad.

Very similar in most respects to *proximata*, differing as follows: Antennæ only about one and a half times as long as width of head; præscutum more broadly rounded cephalad; wings less broadly rounded at apex, sometimes subacute. Female genital segment not over half as long as rest of body, usually less than half; styliform prolongation not, or only a little, longer than basal portion. Male genitalia similar, but anal valve roundly arcuate behind, not angulately; forceps similar.

Described from several males and females from Claremont, California (Baker); Santa Clara County, California (Baker); Santa Cruz, California (Koebele), August 15, 1885; Los Angeles, California (Coquillett); Argus Mountains, California (Koebele).

Type in author's collection.

TRIOZA LONGISTYLUS Crawford.

Figs. 201, 338, 528.

Trioza longistylus CRAWFORD '10a:233; '11a:434.—PATCH '12b:227.

This is very similar to *collaris*, differing only in a few minor details. Genal cones bluntly rounded at apex, instead of acute as in *collaris;* clypeus larger; præscutum more broadly rounded cephalad. Female genital segment about midway in relative length between *collaris* and *proximata;* styliform prolongation relatively longer than in *collaris*.

Described from two females from Colorado (Baker), no data.

Type.—Cat. No. 18083, U. S. Nat Mus.

Miss Patch ('12b:227) assigns to this species several specimens from northern and central California, but these, I believe, belong to the species *collaris*. The two are distinguished with difficulty and it is possible that they are both one species. Until further evidence is available to prove this, however, I will not merge the two species into one.

TRIOZA QUADRIPUNCTATA Crawford.

Figs. 209, 336, 366, 527.

Trioza quadripunctata CRAWFORD '10a:233; '11a:433.—PATCH '12b:229.

Length of body about 2.2 mm; length of forewing 2.5 to 3.3; width of head 0.71. General color greenish yellow to dark brown, hibernating forms darker; antennæ white on basal two-fifths, the rest dark; tibiæ at tip and tarsi brown or black: forewings with four brown or black spots on hind margin.

Head much narrower than thorax; vertex very conspicuously bulging in front, little more than half as long as broad, with a foveal impression posteriorly on each side of median line accentuating anterior bulging; genal cones about two-thirds as long as vertex, acute, divergent, subvertical, only slightly pubescent. Antennæ about twice as long as width of head.

Thorax strongly arched, coarsely punctate; pronotum moderately long, much depressed below præscutum. Legs long; hind tibiæ with three apical spines within. Wings large, only a little more than twice as long as broad, costal margin more arcuate than usual, apex rounded but not broadly so; Rs usually short, straight; with a black spot at tip of clavus, one between branches of cubitus, one between cubitus and media, and a fourth between branches of media; spots sometimes not conspicuous.

Genitalia.—*Male.*—Anal valve about as long as forceps, posterior margin more or less angulately arcuate caudad; forceps long, slender, slightly curved forward, and arcuate toward each other, inner surface concave basally, subacute at apex. *Female.*—Genital segment almost as long as rest of abdomen, acute at apex, dorsal valve a little longer and less acute than ventral.

Described from many males and females from Colorado (type); Los Angeles, California (Coquillett); Bear Paw Mountains, Montana (Hubbard and Schwarz), September 17; Canastota, New York (Faure), hibernating on grass stems, March 12, 1913. Miss Patch has examined a number of specimens from several localities in Colorado: Boulder, Fort Collins (E. D. Ball), and Palmer Lake (Gillette).

Type.—Cat. No. 18084, U. S. Nat. Mus.

Because the species seems to be most common in the west the discovery of many hibernating forms in northern New York is especially interesting and deserving of some attention. The present data does not show whether the species has a wide distribution, or whether this portion of New York is merely an isolated point in its distribution.

The hibernating forms are very similar in all respects to the summer forms, except that the color of the body and wings is uniformly much darker.

TRIOZA ALBIFRONS Crawford.

Figs. 7, 188, 344, 361, 514.

Triosa albifrons CRAWFORD '10a:231; '10b:355; '11a:438.
Trioza rotundipennis CRAWFORD '10a:236; '11a:425.

Length of body 1.9 mm; length of forewing 2.4. General color brown to orange; head brownish, except margin of vertex light; pronotum whitish; præscutum and scutum with light stripes; genital segment of male whitish; antennæ white on basal third, remainder black.

Similar in many respects to *quadripunctata* and closely related to it, differing as follows: Body smaller; thorax narrower, not much broader than head; vertex bulging less conspicuously in front. Legs more slender and relatively longer; apical spines of hind tibiæ small, sometimes only two on inside instead of three. Wings usually more broadly rounded at apex, without marginal spots which are present in the related species; venation similar in most respects, but Rs relatively longer. Male genitalia similar; anal valve less angulate on posterior margin (profile); forceps shorter. Female genitalia similar.

Described from numerous specimens of both sexes from Stanford University, California (Crawford), February and March, 1912, on *Urtica holoserecia;* Nordhoff, California (Crawford), March, 1911, on same host; Claremont, California (Baker); Bear Paw Mountains, Montana (Hubbard and Schwarz), September 17.

Type in author's collection.

Trioza rotundipennis is merely a variant of this abundant species and not specifically distinct. Although the description of this species appeared before that of *albifrons*, the latter preceded it in the preliminary synopsis and therefore has priority in the name.

Both this species and *quadripunctata* are exceedingly closely related to the European species *urticæ*, likewise abundant on nettles. Indeed, it was only after very close comparison that *albifrons* was not merged into *urticæ*. The principal difference lies in the male forceps; in *urticæ* they are constricted midway, broadened distally and terminate in a conspicuous hook-like process, while in *albifrons* they are not constricted midway nor broadened distally and terminate in a black, subacute tip; they are distinctly shorter and stouter also in *albifrons*.

T. quadripunctata is usually easily distinguished from *albifrons* by the wing markings, but sometimes these maculæ are less prominent. It is possible that careful life-history studies will show these two American species to be variants of one species. They are apparently often found closely associated in their habitats.

Nymph.—From 1 to 2 mm in length, according to age, ovate in shape, flat; color: Pale greenish yellow in youngest forms, brown to dark brown in older nymphs; latter with a median dorsal white stripe over entire length, with a fringe of spine-like processes from entire margin and a double row of eight spines on dorsal white stripe. Present in large numbers, singly, on both surfaces of the leaves of *Urtica holoserecia* without flocculence; move about readily and freely. Eggs, nymphs and adults found together in February to April at Stanford University and Nordhoff, California. Adults probably winter over and lay eggs in the early spring. There seem to be several continuous generations.

The *eggs* are deposited on the under side of the leaves in great numbers; they are whitish, pyriform in shape, with the large end attached to the leaf, and the other end terminating in an acute point; they stand erect or nearly so.

TRIOZA FRONTALIS Crawford.

Figs. 184, 342, 355, 358, 359, 362, 513, 518.

Trioza frontalis CRAWFORD '10a: 230; '10b: 353; '11a: 426.
Trioza similis CRAWFORD '10b: 352.
Trioza similis fovealis CRAWFORD '11a: 438.

Length of body 2 mm.; length of forewing 2.9 to 3.2; width of head 0.65. General color brownish red, abdomen brownish; genal cones and antennæ usually black, at least apically.

Head narrower than thorax, deflexed; vertex a little more than half as long as broad, somewhat bulging in front, with a foveal impression (often deep) on each side of median line; genal cones acute, divergent, two-thirds or fully as long as vertex, slightly pubescent. Antennæ about one and a half times as long as width of head, segment III thicker than succeeding segments.

Thorax strongly arched, punctate. Hind tibiæ with three apical spines on inner side. Wings about two and a half to two and two-thirds times as long as broad, narrowly rounded to subacute at apex; Rs usually rather short.

Genitalia.—Male.—Genital segment very large; anal valve very large, produced caudad into a large, broad flap on each side; much broader at apex than at base; apical margin concave, with a fringe of long hairs; with a ridged rib extending into posterior lobe as well as axis. Forceps large, clavate, arcuate inward, apex coarsely toothed or serrated. *Female.*—Genital segment almost as long as rest of abdomen, acute, dorsal valve longer than ventral, apex slender.

Described from several specimens from Colorado (no data); sixteen males and females from Placer County, California (Koebele), on *Amelanchier alnifolia* Nuttall, September 24–30, 1885. These latter are very similar to *obtusa* Patch, a species found on another species of *Amelanchier* in Maine.

Type.—Cat. No. 18085, U. S. Nat. Mus.

TRIOZA FRONTALIS SULCATA Crawford.

Trioza sulcata CRAWFORD '10a: 233.
Trioza frontalis sulcata CRAWFORD '11a: 436.

The differences between the varietal form and the species are slight. Coloration depends on the age of the individual largely, and perhaps this may account for the difference between them. Color dark reddish brown. Præscutum distinctly less arched than in species; notum finely and inconspicuously pubescent.

Described from several specimens from Colorado (no data).

TRIOZA OBTUSA Patch.

Trioza obtusa PATCH '11: 18.

Length of body 2.1 mm.; length of forewing 2.6 to 3.1; width of head 0.77. General color reddish brown; newly emerged individuals pale green, older ones light reddish to dark, wings often dark and smoky; vertex often covered with a white powdery substance.

Very similar and closely related to *frontalis*, differing as follows: Body usually larger, head and thorax relatively distinctly broader, especially the head; vertex finely pubescent, a little more bulging in front; genal cones thicker at base, relatively shorter. Antennæ only about one and a fourth times as long as width of head, segment III sometimes thickened, often not. Thorax strongly arched, sometimes very finely pubescent. Wings large, often smoky; Rs very long, reaching nearly to apex of wing.

Male genitalia similar, except posterior lobe of anal valve is narrower; forceps similar in shape, but apex not toothed, with one indentation anteriorly. Female genitalia similar.

Described from one paratype specimen (female) from Orono, Maine (Patch), collected on *Amelanchier canadensis* (Linnæus) Medicus, in July; several from Washington, D. C. (Koebele), April 6–27, 1885; and Maryland (Koebele), February 22, 1884; these bear the manuscript name of *Trioza amelanchieris* Riley, indicating probably that they were taken on *Amelanchier*, although there is no data to indicate this fact.

This species is remarkably closely related to *T. frontalis*, but seems to be quite distinct, nevertheless. Miss Patch ('11: 19–20) has recorded some interesting and valuable life-history data for this species, which is well worth quoting here.

> The nymphs of this species were found in all stages upon the leaves of *Amelanchier canadensis*. They were collected by Mr. William C. Woods, July 6–27, 1910. They fed upon the ventral surface of the leaves where their presence was readily detected on account of the beautiful white, floss-like wax filaments that curled softly up from the margin of their bodies. These wax filaments are secreted by wax glands which extend in a single marginal row in the earlier stages, but which in the later stages occur both on the margin and for a considerable distance mesad on the dorsal surface of the body. A crescent-shaped area of wax glands surrounds the anus in all the nymphal stages.

TRIOZA LOBATA, new species.

Figs. 140, 143, 401.

Length of body 2 to 2.7 mm.; length of forewing 3.1; width of head 0.76. General color light yellowish brown; abdomen greenish ventrad; sternum partially, genital segment in both sexes, antennal segments IX–X and tips of IV–VIII black; forewings extensively maculated with brown and numerous round darker spots scattered over the maculæ.

Head a little narrower than thorax; vertex large, not quite twice as broad as long, pubescent conspicuously, with a shallow depression on each side of median line, emarginate in front; genal cones scarcely two-thirds as long as vertex, separated somewhat at base and divergent, rounded at apex, pubescent. Antennæ a little less than twice as long as width of head, conspicuously ringed.

Thorax rather strongly arched, covered sparsely with rather long hairs. Pronotum short, strongly descending cephalad. Mesothorax large. Legs short and thick; hind tibiæ with two thick black spines at apex on inner side and one on outer side. Wings large, less than two and a half times as long as broad, broadly angulate at apex, veins heavy; maculated conspicuously (fig. 401); marginal cells large, subequal; Rs long.

Genitalia.—*Male.*—Anal valve with a long caudal lobe on each side, longer than axis of valve and converging to a narrow tip, reaching a little beyond forceps. Forceps long, slender, narrowed midway, abruptly broadened distad into a T-shaped end; from behind, arched strongly laterally and appearing acute at end, broad at base. *Female.*—Genital segment not longer than preceding ventral sclerite, small, acute, dorsal valve slightly longer than ventral, pubescent.

Described from twelve males and females from Los Angeles, California (Koebele), taken on "a species of *Ceanothus*"; one female from Arizona (Morrison), 1882 (no data).

Type.—Cat. No. 18086, U. S. Nat. Mus.

This is a very easily distinguished species because of its conspicuously marked wings. The name *lobata* is Riley's manuscript name for this species.

TRIOZA TRIPUNCTATA Fitch—not Loew.

Figs. 198, 334, 368, 524.

Psylla tripunctata FITCH '51:64.—RILEY '80:62.—LINTNER '93:64.

Trioza tripunctata RILEY '84:70.—MALLY '94:154 (*Phyllopleta id.*?).—SMITH '09:110.—CRAWFORD '10a:231, 232; '11a:430.—PATCH '12:230.

Psylla rubi WALSH and RILEY '69:225.—THOMAS '79:17.—FULLER '80:62.—RILEY '80:62 (footnote).

Length of body (female) 2.6 mm; (male) 2.1; length of forewing 3 to 3.5; width of head 0.79. General color brown to dark brown, dorsum often black; head lighter; antennæ yellowish, black at tip; legs light brown.

Head much narrower than thorax; vertex rather flat, with a slight depression discally on each side of median line, more than half as long as broad, front margin a semicircle; genal cones about two-thirds as long as vertex, thick at base, subacute, usually not deflexed much from plane of vertex, pubescent. Antennæ about one and a half times width of head, slender.

Thorax broad, arched strongly. Pronotum short. Legs rather long and thick; hind tibiæ with two large spines on inner side, one outside. Wings large, about two and a half times as long as broad, subacute at apex, with three brown bands, one on Cu and extending into basal subcostal cell, another on M, and the third on distal half of Rs; marginal cells small; Rs long.

Genitalia.—*Male.*—Genital segment rather large; anal valve produced caudad into a long distally rounded lobe (in lateral view); forceps long, curved forward, tapering to an acute point at apex, with three sharp edges. *Female.*—Genital segment acute at apex, from one-half to three-fourths as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from: Washington, District of Columbia (Koebele), February to May, 1884; Virginia (no data); Holderness, New Hampshire (Koebele); Jamaica, Long Island (Sirrine), October 11. Reported (Patch '12b:230) at Orono and Sebago Lake, Maine, on blackberry bushes, August, 1904 and 1911; said to be abundant on this host plant. Reported also from several localities in New York State.

The *nymphs* and pupæ are yellowish and pellucid, the head and thorax being a deeper yellow than the rest of the body; eyes are dark red; meso- and metathorax sometimes pale green. They are surrounded by flocculent, white fluff on the ventral surface of the blackberry leaves (Patch '12b:230). Both nymphs and imagines found in August.

TRIOZA ARIZONÆ Aulmann.

Figs. 189, 357, 363, 515.

Trioza marginata CRAWFORD '10a:232; '10b:356.—PATCH '12b:228.
Trioza arizonæ AULMANN '13:39 (new name).

Length of body 2 mm; length of forewing about 3; width of head 0.70. General color light brown, mesoscutellum often with two darker stripes; antennæ and legs lighter colored; abdomen pale ventrad.

Head narrower than thorax, much broader than prothorax; vertex slightly impressed discally and postocellar areas well elevated, about twice as broad as long, scarcely emarginate in front at median line. Genal cones about two-thirds as long as vertex, slightly divergent, subacute, sparsely pubescent. Antennæ about one and a half times as long as width of head.

Thorax strongly arched, moderately broad; pronotum very short, much longer than præscutum. Hind tibiæ with two small spines at apex within and one outside. Wings slender, nearly three times as long as broad, subacute at apex, with a more or less pronounced brown band along posterior margin.

Genitalia.—Male.—Anal valve with a relatively large lobate projection caudad on each side, somewhat as in *maura;* forceps slender, simple, acute, and slightly toothed on inner margin apically. *Female.*—Genital segment short, scarcely longer than preceding segment, very acutely pointed; dorsal valve slightly longer than ventral.

Described from one male and several females from Arizona (no data), and one from Fort Yuma, Arizona (Hubbard), January 20.

Type.—Cat. No. 18087, U. S. Nat. Mus. (Type of *T. marginata.*)

This species shows a marked resemblance to *T. maura*, but is sharply differentiated from it by the maculation of the wings.

TRIOZA MAURA Förster.

Figs. 190, 192, 354, 365, 370, 371, 372, 517, 520, 522.

Trioza maura Foerster '48:94.—Meyer-Dür '71:387.—Loew '82:242; '84:144 (nymph); '88:24.—Oshanin '07:376.—Sulc '11:10 (bibliography and good figures).—Patch '12b:228.
Trioza helvetina Meyer-Dür '71:388, 391.
Trioza nigrifrons Crawford '10a:230; '10b:351.
Trioza fulvida Crawford '10a:231; '10b:358.
Trioza fulvida similis Crawford '10b:359.
Trioza aurantiaca Crawford '10a:231; 10b:360; '11c:628.

Length of body 1.8 to 2.3 mm; length of forewing 2.8 to 3.5; width of head 0.65 to 0.73. General color variable from light orange yellow to dark reddish brown or dark red; vertex and cones usually reddish, sometimes pale on margin, occasionally dark brown or even black; antennæ white usually on basal third or half, the rest orange to black; abdomen pale ventrad, though sometimes not; legs orange, tarsi often black. The autumn forms are usually darker than the spring forms.

Head narrower than thorax; vertex rather flat, a little more than half as long as broad, with front margin broadly and evenly rounded and raised slightly, with a shallow or deeper foveal impression discally on each side of median line. Genal cones two-thirds to three-fourths as long as vertex, divergent, acute, slightly pubescent, more or less deflexed from plane of vertex. Antennæ about one and a half times as long as width of head, nearly always whitish at base.

Thorax strongly arched, punctate; pronotum short; legs slender to rather stout; hind tibiæ with two black spines at apex on inner side and one without. Wings variable in length, usually about two and a half times as long as broad, subacute to narrowly rounded at apex, usually clear, but sometimes more or less fulvous or smoky, anal angle black; Rs usually long, rarely shorter and straight.

Genitalia.—*Male.*—Anal valve short, with an ovate, lobate prolongation caudad reaching about to base of forceps, longer than broad; anus on a slightly elevated ring above caudal prolongation. Forceps long, curved forward, very acute, and acuminate, sharply edged. *Female.*—Genital segment very short, scarcely longer than preceding segment, acute at apex, dorsal valve slightly longer than ventral.

Described from numerous males and females from the following localities: *California:* Laguna Beach (Crawford), August, 1911, on *Salix lasiolepis;* Los Angeles (Coquillett); Placer County (Koebele), September, on *Salix lasiolepis;* Nevada County (Koebele), September; Folsom (Koebele), August 18, 1885, on *Salix longifolia* (these bear the manuscript name of *Trioza saliciperda* Riley); San Mateo

(Koebele), September, on *Salix lasiolepis;* Ormsby County, Nevada (C. F. Baker); Colorado (no data), on *Salix;* Santa Fe, New Mexico (H. S. Barber); American Forks, Utah (Hubbard and Schwarz); Oregon (Koebele); Easton, Washington (Koebele); Algonquin, Illinois, July 12, 1895.

Nymphs, also, have been taken on *Salix lasiolepis*, showing that the willows are undoubtedly the food plant of the species.

This is a very abundant species and subject to some variation, as the above synonymical list shows. After careful examination of numerous specimens from many localities and comparison with Sulc's excellent figures ('**11**: pl. 14), it is apparent that all these variants (formerly described as species) belong to one and the same species, and, furthermore, that this species is identical with the European species *maura* Forster. The distribution seems to be exceedingly wide. The food plants, both here and in Europe are species of *Salix*, the willows.

According to the description by Sulc (I have seen no European specimens) there are some slight differences between the European and American forms. The head, in the latter, is typically orange with some black, while Sulc described it in the European forms as typically mostly black. The abdomen, too, in the American forms is typically white or pale ventrad, while Sulc describes the abdomen as entirely brown. In the American forms, however, these characters are not constant, and therefore, these differences in description between the American and European forms are not surprising.

The following is taken from Loew ('**84**:144–145): *Nymph* flat, 2.5 mm long and 2 mm broad, egg-shaped, glabrous, green, yellow, or yellow with greenish spots; with a dark brown dorsal stripe and several cross bands; eyes red; with a fringe of hyaline hair-like projections around entire margin, about as long as width of brown bands.

Found singly on the under surface of leaves of *Salix alba* and *S. purpurea;* Adults emerge about the first of October and over-winter. In the following May and June the females oviposit. Parasitized nymphs are black and always on the upper surface of the leaves.

It is quite probable that the American forms pass through a similar life history, since adults may be collected in late autumn.

The following two species, *T. salicis* and *T. varians*, are very closely related to this species and often very difficult to distinguish from it. The male genitalia are very similar in the three species, differing only in slight details; the female genital segment, however, shows some specific differences. It is possible that these three should be considered as one polymorphic species, but since they can be distinguished it is just as well to regard them as specifically distinct. *T. marginata* is, also, closely related to this group of three species.

TRIOZA SALICIS Mally.

Figs. 191, 195, 196, 202, 335, 337, 341, 364, 387, 516, 525, 526, 530.

Trioza salicis MALLY '94:161.—CRAWFORD '11a:432.
Trioza assimilis CRAWFORD '10a:233; '11a:438; '11b:503 (name changed to *flori*).
Trioza flori CRAWFORD '11b:503 (footnote).
Trioza pomonæ AULMANN '13:51.
Trioza dubia PATCH '12b:226.
Trioza nigra CRAWFORD '10b:358; '11b:503 (changed to *nigrilla*).
Trioza louisianæ AULMANN '13:48.
Trioza minuta CRAWFORD and var. *similis* CRAWFORD '11a:432, 433.

Very similar to *maura* in size and proportions; color similar, except vertex and cones typically dark to black, occasionally light; abdomen not white ventrad. Most of the structural difference are slight and difficult to describe. Vertex lobately swollen in front on each side of median line, more coarsely punctate. Wings similar, subacute to narrowly rounded at apex, seldom flavous, usually clear, anal angle seldom dark.

Genitalia.—Male.—Anal valve similar, but caudal prolongations shorter, sometimes shorter than broad; forceps often shorter. *Female.*—Genital segment twice as long as in *maura*, slender, acute, dorsal valve longer than ventral.

Described from many specimens of both sexes from the following localities: Ames, Iowa (Mally), September to December, 1894, on *Salix* sp.; Stanford University, California (Crawford), September, on *Salix lasiolepis;* Santa Clara County, California (Baker); Leona Heights, Alameda County, California (J. C. Bradley), August; Placer County, California (Koebele), October (these are labeled *Trioza pyrifoliæ*[1] (?) Forbes: Ormsby County, Nevada (Baker); Colorado; Easton, Washington (Koebele); District of Columbia, August 24, 1899.

I have examined three paratypes (one male and two females) of *T. dubia* Patch, and find this species to be identical with *salicis*. These specimens are from San Francisco, California (Bradley) The similarity between *flori* and *salicis* was noticed in the preparation of the previous papers, but no males of *salicis* were then available and therefore the identity of the species could not be established. The Iowa forms have relatively shorter genal cones than the western forms and less divergent, but I believe this is only a minor variation.

TRIOZA VARIANS Crawford.

Figs. 194, 369, 523.

Trioza varians CRAWFORD '10ac:231; '10bc:361; '11c:628.

Similar in size and general proportions to *maura*. Color characters conspicuous: general color brown to black; vertex dark with a broad yellow border; cones dark; pronotum orange; præscutum orange on

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[1] I have been unable to obtain authentic specimens of this species, and have not included it in the synoptic table of species.

hind margin and a longitudinal dorsal stripe; scutum with several orange stripes; femora black, tibiæ orange; antennæ as in *maura;* female genital segment usually dark with an orange spot dorsad. These colors may be much less pronounced in some forms, though this is typical.

Vertex and head rather similar to *maura*. Wings smoky, seldom fulvous, usually broadly rounded at apex. Male anal valve similar, but smaller, as in *salicis*, distinctly more pubescent; forceps more pubescent. *Female.*—Genital segment very short, as in *maura*, dorsal valve blunt at apex.

Described from many specimens from Alta, Utah (Hubbard and Schwarz), June 30, on *Salix* sp.; Banff Springs, Alberta, Canada (Hubbard and Schwarz), June 10; Placer and Nevada Counties, California (Koebele), September; Colorado (Gillette).

Type.—Cat. No. 18088, U. S. Nat. Mus.

The most typically colored specimens are from Alta, Utah.

TRIOZA LONGICORNIS Crawford.

Figs. 193, 367, 521.

Trioza longicornis CRAWFORD '10b: 359.

This is apparently very close to *varians* and perhaps identical. The type, and only, specimen on which the description was based is not before me, and therefore I am unwilling to refer it to *varians*. It has not been included in the synoptic tables because certain of its characters are not known to me. The following description is adapted from the original one.

Length of body 2.4 mm; length of forewing 3.6; width of head 0.72. General color greenish yellow, notum slightly darker.

Vertex sharply defined on front margin, with two broad depressions diverging toward front margin from the usual foveæ near posterior margin; emarginate in front at median line; genal cones long, fully as long as vertex, divergent, acute at apex, pubescent. Wings transparent, about two and a half times as long as broad, broadly rounded at apex; Rs long; veins yellowish.

Genitalia—Female.—Genital segment short, about as long as preceding ventral sclerite, dorsal valve longer than ventral.

Described from one female from Vancouver, British Columbia.

Type.—Cat. No. 18089, U. S. Nat. Mus.

TRIOZA NICARAGUENSIS Crawford.

Figs. 212, 339, 534.

Trioza nicaraguensis CRAWFORD '11a: 436.

Length of body 1.7 mm; length of forewing 3.1; width of head 0.55. General color lemon yellow; antennæ black at tip. Insect small.

Head not as broad as thorax, finely punctate; vertex not deeply sulcate, with a small fovea on each side, bulging forward on each side of the median line in front; genal cones short, scarcely two-thirds as long as vertex, acute, divergent, very slightly pubescent. Antennæ slightly over one and one-fourth times width of head, slender.

Thorax arched rather strongly; pronotum short. Legs slender; hind tibiæ with two very small spines at apex inside and one outside. Wings small, transparent, about three times as long as broad, subacute at apex.

Genitalia.—Female.—Genital segment large at base, subglobose, each valve produced at end into a short, slender, acutely pointed process.

Described from one female from San Marcos, Nicaragua (C. F. Baker).

Type in author's collection.

The genitalia are very easily recognizable in this species.

TRIOZA STYLIFERA Patch.

Figs. 139, 414.

Trioza stylifera PATCH '12b:229.

Width of head 0.61 mm; length of forewing 2.4 to 2.6. General color brownish; antennæ pale brown, dark at tip.

The only specimen before me of this species is a balsam mount containing the head, both wings, and the male cauda of one specimen, consequently not all the usual characters can be given.

Vertex more than half as long as broad, somewhat emarginate in front at median line; genal cones scarcely two-thirds as long as vertex, rather strongly divergent, acute at apex, slightly pubescent. Antennæ about one and a half times as long as width of head. Because of its resemblance to certain other species I have inferred that the hind tibiæ have two spines at apex on inner side (an uncertain inference), and have placed it in that category in the synoptic tables. Wings yellowish, broadly rounded at apex, with a slight degree of angulation at tip of medial vein; Rs short and straight; venation suggesting *albifrons* somewhat.

Genitalia.—Male.—Anal valve moderately large, produced caudad a little (in lateral aspect); forceps nearly as long as anal valve, narrowed midway, then broadened and thinner at apex and forming a hood. *Female.*—Genital segment "relatively long and acutely pointed; the upper plate extends a bit beyond the ovipositor and is slender at tip" (Patch).

Described from one male (paratype?) mounted in balsam (with thorax and legs wanting), kindly loaned to me by Miss Patch; collected at Brockville, Ontario (W. Metcalfe), October, 1903.

TRIOZA AYLMERIÆ Patch.

Trioza aylmeriæ PATCH '12b:225.

Two balsam mounts of this species containing two heads, four wings and a male and female cauda have been loaned to me by Miss Patch. As in the case of *T. stylifera*, the inference that the hind tibiæ possess two apical spines on the inner side is based on its resemblance to certain species with this character.

Head about 0.82 mm broad, more than half as long as broad; genal cones scarcely two-thirds as long as vertex, acute to subacute, divergent, pubescent. Antennæ about one and a half times as long as width of head, rather thick. Wings rather slender, about 3.2 mm long, broadly angulate at apex, with a tinge of flavous; veins yellow; venation typical.

Genitalia.—*Male.*—Anal valve large, with a pair of very long, lobate processes extending caudad and somewhat upward, from basal two-thirds of valve; with many very long hairs at end of processes; forceps rather long, constricted subapically, apex enlarged. *Female.*—Genital segment longer than preceding ventral sclerite, but not as long as the two preceding, acute at apex, dorsal valve a little longer than ventral.

Described from portions of one male and one female (paratypes?), mounted in balsam; locality: Aylmer, Ottawa, Ontario, Canada (W. Metcalfe), on "Bilberry," May 20, 1906.

TRIOZA ALACRIS Flor.

Figs. 137, 421.

Trioza alacris Flor '61:380, 386, 393, 398.—Loew '82:230; '86:160; '88:22.—Oshanin '07:372.—Dickel '05:402.—Thomas '91:92.—Crawford '12a:86.—Sulc '12:49.

Trioza lauri Targioni-Tozetti, Resocont. Soc. Ent. Ital., 1879:19.

Length of body 1.9 mm; length of forewing 3.2; width of head 0.71. General color greenish yellow to light brown; dorsum in darker individuals more or less striped and streaked with brown; abdomen often brown; antennæ black at tip.

Head nearly as broad as thorax, not strongly deflexed; vertex more than half as long as broad, emarginate in front at median line, with a prominent sulcate impression on each side of median line and parallel to it; genal cones scarcely two-thirds as long as vertex, divergent, subacute, pubescent, not much depressed from plane of vertex. Antennæ about one and a third times width of head, slender.

Thorax not broad, well arched, punctate; pronotum moderately long, not strongly depressed; præscutum rather large. Legs slender; hind tibiæ with two black spines at apex on inside and one outside. Wings long, slender, transparent, fully three times as long as broad, subacute at apex; Rs short.

Genitalia.—*Male.*—Anal valve a little longer than forceps, hind margin arcuate, with long pubescence; forceps rather stout, sides almost parallel (from side), terminating in a subacute, black point at apex. *Female.*—Genital segment nearly as long as rest of abdomen, acute at apex, valves subequal in length (Sulc figures the dorsal valve as a little longer than the ventral, '12: pl. 32).

Described from eleven males and females collected in San Mateo County and Alameda County, California (O. E. Bremner), November 18, 1911, on *Laurus nobilis*. These infested trees had been imported from Belgium several years previous. The species is well known and destructive throughout Europe, but so far the San Francisco Bay region is the only place in this country in which it has been found.

Nymph.—The half-grown or mature nymph is light to dark brown, somewhat mottled with lighter spots, about 1.5 to 2 mm long, ovate in shape and flat. The entire dorsal surface, including wing pads, is covered with conspicuous spine-like processes; margin with a fringe of similar spines. Young nymph pale green, spines smaller. A white cottony substance is produced by the nymphs, in which they are wrapped. The leaves of the laurel are badly curled and thickened by the action of the nymphs, and the insects may be found in considerable numbers within these leaf-rolls or pseudo-galls.

The life cycle of the insect in this country is probably similar to that in Europe, from where these individuals came. Loew thinks that the adults emerge in May or June, and a second brood appears in late summer and passes the winter in hibernation, then oviposit early in the spring. The nymphs from these eggs develop the first brood of that year. In California the time of emergence may be earlier because of the more favorable climate.

TRIOZA VIRIDIS Crawford.

Figs. 182, 183, 351, 353, 511.

Trioza viridis CRAWFORD '10a: 230; '10b: 350.
Allotrioza viridis CRAWFORD '11a: 446.

Length of body 2 mm; length of forewing 2.4; width of head 0.62. General color greenish yellow, female ovipositor black at apex; antennæ brown or black apically. Body small.

Head much narrower than thorax; vertex three-fourths as long as broad, with a deep and conspicuous sulcate depression on each side of median line and more or less parallel to it; genal cones three-fourths as long as vertex, divergent, rather thick, subacute at apex, extending in nearly the same plane with vertex, pubescent. Antennæ over twice as long as width of head, slender.

Thorax arched only a little, broad; pronotum moderately long. Hind tibiæ with two very small black spines at apex on inner side, one outside. Wings small, transparent, about two and two-thirds times as long as broad, acute at apex; Rs very short.

Genitalia.—*Male.*—Genital segment small; anal valve not longer than forceps, rectangular in outline, about twice as long as broad, sharply flexed caudad a little at about end of basal third, sides subparallel, apex square, with sharp, black edge. *Female.*—Genital segment almost as long as rest of abdomen, large and thick, rounded caudad, and each valve produced into a short, slender, acute process, the dorsal one distinctly longer than ventral.

Described from one male and two females from Claremont, California (C. F. Baker), and one female from Los Angeles, California (Coquillett).

Type in author's collection.

TRIOZA MAGNOLIÆ Ashmead.

Figs. 199, 343, 390, 533.

Psylla magnoliæ Ashmead '81: 224.
Trioza magnoliæ Riley '83: 70.—Crawford '10a: 228.
Allotrioza magnoliæ Crawford '11a: 445.

Length of body (female) 2.9 mm.; (male) 2.1; length of forewing (female) 3.8 to 4; (male) 2 mm.; width of head 0.94. General color greenish yellow; tips of antennæ, tarsi, beak, black or brown. Body large.

Head large, nearly or fully as broad as thorax; vertex about twice as broad as long, with a deep foveal or sulcate depression on each side of median line, coarsely punctate. Genal cones two-thirds to three-fourths as long as vertex, thick, divergent, subacute. Antennæ long and slender, twice as long as width of head or more.

Thorax large, broad, not strongly arched, coarsely punctate; pronotum moderately long, depressed below head and præscutum; præscutum distinctly longer than broad. Legs long; hind tibiæ with two large spines at apex within, and one on outer side. Forewings large, about three times as long as broad, subacute at apex, transparent; venation resembling that of *Paratrioza arbolensis* somewhat.

Genitalia.—*Male.*—Abdomen constricted just before genital segment; latter rather large; anal valve slightly longer than forceps, caudal margin strongly arcuate, front margin nearly straight, narrow at apex, pubescent. Forceps moderately broad, front margin bowed forward, with a black, sharp apex, which is in line with the posterior edge; caudal margin pubescent. *Female.*—Genital segment nearly as long as rest of abdomen, valve subequal in length, acutely pointed, pubescent.

Described from many males and females from Crescent City, Florida (H. G. Hubbard); Biscayne Bay, Florida (Schwarz), May 10; Savannah, Georgia (Schwarz), April 15, 1884; Billys Island and Honey Island, Okefenoke Swamp, Georgia, June, 1912 (J. C. Bradley, and others).

This species according to Ashmead ('81: 224) is a true gall-maker on leaves of *Magnolia glauca*, the common bay magnolia of the southern swamps. Ashmead describes the galls as being "quite conspicuous on the leaves, of a large size, greenish in color with a bluish plume, and when fully mature open along the side in the form of a large, curved lip." They are half an inch or more in length.

Ashmead was unable to find the eggs on the leaves and concluded that they were deposited beneath the surface within the tissue.

Nymphs are abundant in the galls in various stages of growth and surrounded by a milky fluid which usually almost fills the galls. They are elongate-ovate, over 2 mm. long when mature, flattened, pale yellow to green, without marginal hairs, not pubescent. He does not state the times of emergence of the adults, but from the data accompanying the specimens at hand, it appears to be April to June.

TRIOZA KOEBELEI Kirkaldy.

Trioza koebelei KIRKALDY '05 : 290.

Very similar to *T. magnoliæ* in size and general appearance, differing as follows: Color darker, light brown to dark blackish brown; "head and thorax varying from dark fulvous to blackish, polished, shining; antennæ testaceous except apically; femora dark fulvous or blackish brown, tarsi and tibiæ testaceous except apices of apical tarsal segments; abdomen smooth, polished, and shining, with a dark bluish-green gloss." Head broader than anterior portion of thorax but distinctly narrower than broadest part; genal cones relatively shorter and more horizontal than in related species (*magnoliæ*); antennæ distinctly less than twice as long as width of head. Thorax similar; wings similar, but marginal cells subequal or the second larger. Genitalia of female similar.

According to Kirkaldy's poor illustration, the male genitalia are quite different.

Described from two females from Cuernavaca, Morelos, Mexico, collected by A. L. Herrera, on *Persea gratissima* (alligator pear, or aguacate, or avocado), February, 1906. The specimens are much lighter in color than those described by Kirkaldy, but they seem surely to be his species. He describes the head and eyes as being broader than the thorax, but he undoubtedly meant the anterior portion of the thorax and not its broadest part.

The gall is described as being large, light brown, ovoid with a truncate base, and placed erect usually on the upper surface of the leaves. Height about 6 mm. The insect is said to be very destructive.

One late nymph, in the collection before me, is darker in color than that of *magnoliæ*, and is covered with long sparse pubescent on the dorsal surface.

Genus CECIDOTRIOZA Kieffer.

This genus is unknown to me in nature and has not been included in the synoptic table of the genera. As near as can be determined from Kieffer's descriptions, its members come near to *Trioza magno-*

liæ and *koebelei.* The genus is probably not distinct from *Trioza*, but no disposal of it will be made until specimens of its species are available for comparison.

Two species have been described in the genus, one from Argentina, South America, and the other from Asia. Both are gall-forming (as are also the two *Trioza* species mentioned above), the Argentine form being on *Baccharis.*

CECIDOTRIOZA MENDOCINA Kieffer.

Cecidotrioza mendocina KIEFFER '10 : 372.

Locality.—Province of Mendoza, in Pedragal and Chacras de Coria, Argentine Republic; December to last of June.

Galls on *Baccharis salicifolia.* The flower head is greenish, becoming enlarged, thick, three to four times normal size, 8 to 9 mm. long, and almost as thick; the bractlets are enlarged and produced, linear and curled at the tip (Kieffer '**10**: 372).

Genus NEOTRIOZELLA Crawford.

Head as broad as or broader than thorax, latter narrow; genal cones long, usually slender, not at all divergent, but closely appressed from base to tip, acute at apex, usually vertical; vertex more or less plane; antennæ more than twice as long as width of head. Pronotum short, descending strongly cephalad, much depressed below level of head and præscutum. Forewings elongate; hind tibiæ with three spines at apex within.

Type of genus.—*Neotriozella immaculata* Crawford.

The members of this genus are very peculiar, and easily distinguished from other species by the remarkable form of the genal cones. The original name *Neotrioza* was found to be preoccupied by *Neotrioza machili* Kieffer (1905), and was consequently changed to *Neotriozella* (Crawford '**11b**: 503, note).

SYNOPSIS OF SPECIES.

a^1. Genal cones longer than vertex; forewings two and a half to three times as long as broad.
  b^1. Genal cones slender, acute at apex, whitish; vertex reddish with light margins; antennæ rather slender.................................*immaculata* Crawford.
  b^2. Genal cones moderately thick, less acute at apex, strigate, dark brown; vertex brown; antennæ moderately thick...............*sculptoconus*, new species.
a^2. Genal cones not longer than vertex; forewings three times as long as broad; vertex and genal cones black ....*laticeps* Crawford.

NEOTRIOZELLA IMMACULATA Crawford.

Figs. 205, 213, 216, 332, 539.

Trioza immaculata CRAWFORD '10a: 233.
Neotrioza immaculata CRAWFORD '11a: 450.
Neotriozella immaculata CRAWFORD '11b: 503.
Neotriozella ottawanensis PATCH '12b: 231.

Length of body 1.7 mm.; length of forewing 2.7; width of head 0.59. General color reddish brown to red; thorax lighter than abdomen;

vertex black to reddish with yellowish border; genal cones whitish, sometimes brown at tip; antennæ black; præscutum darker on anterior third; scutum with four brown stripes; legs light colored.

Head deflexed, broader than thorax, surface smooth, slightly pubescent; vertex broadly and shallowly impressed on each side of median line, front margin rather sharply defined, slightly emarginate over anterior ocellus. Genal cones longer than vertex, very slender, acuminate, acute at apex, vertical or even retrose, very sparsely pubescent. Antennæ slender.

Thorax arched, narrow, slightly punctate, sparsely and briefly pubescent. Pronotum short; præscutum about as long as broad, rounded narrowly cephalad. Wings rather long, hyaline, from two and a half to three times as long as broad, acute to subacute apically.

Genitalia.—*Male.*—Genital segment small; forceps spatulate, broadest at apex, a little shorter than anal valve; latter long, broader at base than at tip, rather densely pubescent. *Female.*—Genital segment half as long as rest of abdomen, tapering evenly to a very acute point; dorsal valve longer than ventral.

Described from one male from Algonquin, Illinois (Dr. Nason), the type, and two females from Ames, Iowa (C. W. Mally), May, 1895; one female from Washington, District of Columbia (Schwarz), October, 1883; one female "dipped from surface of ocean 94 miles from Nova Scotia, July 3, 1887." The latter bears the manuscript name of *Trioza proboscidia* Riley. Miss Patch's *N. ottawanensis*, two paratypes of which I have examined and found to belong to this same species, are from Ottawa and Aylmer, Ontario, Canada (W. Metcalfe), May, 1903 and 1905, one of them having been collected on "pine."

Type.—Cat. No. 18090, U. S. Nat. Mus.

NEOTRIOZELLA SCULPTOCONUS, new species.

Length of body 1.8 mm.; length of forewing 2.6. General color reddish to reddish brown; pronotum and hind margin of vertex whitish; vertex dark red with light margins; antennæ and genal cones black; legs light brown.

Head not, or slightly, broader than thorax, deflexed; vertex as in *immaculata*, slightly pubescent; genal cones a little longer than vertex, thicker than in congenors, closely approximate, vertical, subacute at tip, with rather coarse transverse striæ, scarcely pubescent, tipped with orange. Antennæ about twice as long as width of head, III a little thicker than succeeding segments.

Thorax somewhat arched, narrow, punctate. Legs slender, rather long. Wings hyaline, a little more than twice as long as broad, acute at apex; venation similar in type to that of congenors.

Genitalia.—*Male.*—Genitalia resemble those of *immaculata;* anal valve relatively longer and produced more into a posterior lobe; forceps broadest subapically, flattened at apex.

Described from two males from California, one from Placer County, the other from Castle Peak, Nevada County, both collected by A. Koebele in September.

Type.—Cat. No. 18091, U. S. Nat. Mus.

This is close to *immaculata,* in some respects, differing chiefly in head characters. One of the two specimens bears the manuscript name of *Trioza frontalis* Riley.

NEOTRIOZELLA LATICEPS Crawford.

Figs. 206, 214, 249, 528.

Trioza laticeps Crawford '10a: 233.
Neotrioza laticeps Crawford '11a: 450.
Neotriozella laticeps Crawford '11b: 503.

Length of body 1.6 mm.; length of forewing 2.7; width of head 0.62. General color dark brown, thorax lighter; head and genal cones black.

Head strongly deflexed, distinctly broader than thorax, slightly punctate; vertex rather sharply defined on margin, scarcely impressed discally, slightly emarginate over front ocellus; genal cones not longer than vertex, acute, more abruptly converging to apex than in *immaculata,* vertical or retrose, slightly pubescent. Antennæ very slender.

Thorax arched, narrow, punctate, slightly pubescent. Wings hyaline, narrower than in *immaculata,* relatively longer usually, subacute at apex.

Genitalia.—Female.—Genital segment almost as long as rest of abdomen, very acute at apex; dorsal valve longer and larger than ventral, very acute.

Described from one female collected by G. R. Pilate in Louisiana. This is very close in many respects to *immaculata.*

Type.—Cat. No. 18092, U. S. Nat. Mus.

Genus CEROPSYLLA Riley.

Ceropsylla Riley '83: 76.
Triozoida Crawford '11b: 491.

Head deflexed, not as broad as thorax; vertex more or less plane, except postocellar areas conspicuously elevated, bulging lobately in front between antennal bases, with front ocellus not or scarcely visible from above; genal cones short to long, separated but not strongly divergent, vertical. Genæ swollen close behind antennal sockets; clypeus at least moderately large (very prominent in *johnsonii*). Antennæ usually not over twice as long as width of head. Thorax arched; pronotum short; strongly descending cephalad, depressed below level of vertex and præscutum. Hind tibiæ with two apical spines within, and one outside. Wings hyaline, usually acute at apex; basal vein (R + M + Cu) relatively longer than in most species of the genus *Trioza*, distinctly more than one-fourth the length of the wing (very long in *sideroxyli*); M and Cu sometimes petiolate at base, or with a distinct tendency toward such a character.

Type of genus.—*Ceropsylla sideroxyli* Riley.

The two species of *Triozoida* Crawford ('11b: 491) are closely enough related to Riley's species to justify placing them in the same genus and making *Triozoida* a synonym of *Ceropsylla*. The long basal vein (unusually long in the type-species), the type of origin of M and Cu with the tendency toward becoming petiolate, the general appearance of the vertex and genal cones all denote a mutual relationship. This was overlooked at the time of erecting the genus *Triozoida*, but since then specimens of *C. sideroxyli* have become available for comparison, and, therefore, this change is made.

SYNOPSIS OF SPECIES.

a^1. R+M+Cu longer than Rs; genal cones short, scarcely half as long as vertex; vertex very conspicuously bulging in front; M and Cu scarcely petiolate. *sideroxyli* Riley.

a^2. R+M+Cu shorter than Rs; genal cones nearly or fully as long as vertex.

  b^1. M and Cu scarcely or only slightly petiolate; clypeus subglobose; genal cones as long as vertex; antennæ whitish on basal third........*californica* Crawford.

  b^2. M and Cu distinctly petiolate; clypeus elongate, vertical, nearly as long as genal cones and similar in shape; genal cones not quite as long as vertex; antennæ black from base to tip................................*johnsonii* Crawford.

CEROPSYLLA SIDEROXYLI Riley.

Figs. 138, 407.

Ceropsylla sideroxyli RILEY '83: 76.

Length of body 2.1 mm; length of forewing 2.9; width of head 0.74. General color greenish yellow on the upper side, abdomen and venter green; præscutum brownish on anterior half or two-thirds; head with a black area between antennæ, extending up around front ocellus and including genal cones; antennæ brown, greenish on basal half.

Head much narrower than thorax; vertex with posterior ocelli greatly elevated, rest of surface smooth, almost flat, a little more than half as long as broad between eyes, emarginate in front at median line (when viewed dorsally); view from in front shows vertex acutely angled downward with a subcircular elevated area around front ocellus; antennal sockets and genal cones more inferior than in *Trioza;* cones small, between and below antennal sockets, almost parallel to each other, vertical, blunt at apex, with a few long setæ. Eyes large. Antennæ not over twice as long as width of head, flattened and broadened at apex.

Thorax arched rather strongly, broad, finely strigate. Pronotum short; mesopleurites large; legs moderately stout. Wings long, transparent and clear, about two and a half times as long as broad, acute at apex; basal vein unusually long, longer than Rs, dark and heavy; Rs short; first marginal cell much larger than second.

Genitalia.—Male.—Anal valve large, almost as broad as long; posterior margin strongly arcuate, anterior nearly straight; forceps as long as anal valve, slender, sinuate (posterior view), and very acute at apex. *Female.* Genital segment short, not much longer than preceding ventral sclerite, not very acute at apex, dorsal valve a little larger and longer than ventral.

Described from eight males and females from Lake Worth, Florida (E. A. Schwarz), June.

Type.—Cat. No. 18093, U. S. Nat. Mus.

Riley stated that the larva of this species is very peculiar in form. "Full-grown larvæ were found by Mr. Wittfeld at Georgiana, in southern Florida, on the under side of leaves of *Sideroxylon masticodendron*, embedded in small, scattered, cup-shaped excavations, which on the upper side of the leaves appear as rough, elevated pustules. A white waxlike (not flocculent) excretion covers the dorsal surface of the larva and has suggested the generic name" (Riley). The immature forms of the other two species are not known yet.

CEROPSYLLA CALIFORNICA Crawford.

Trioza californica CRAWFORD '10a:234.
Triozoida californica CRAWFORD '11b:492.

Length of body 2 mm; length of forewing 3.35. General color dark brown to orange, head almost black, darker than thorax; abdomen greenish white ventrally, dorsally black; legs uniform reddish brown; antennæ brown to black, except segments II to III whitish.

Head almost as broad as thorax, finely punctate; vertex about half as long as broad, bulging in front roundly and emarginate at median line; postocellar areas not as much elevated as in the other two species; genal cones large, about as long as vertex, vertical, divergent slightly, subacute, coarsely punctate or strigate; clypeus globose, not unusually large. Eyes large. Antennæ scarcely twice as long as width of head, not very slender.

Thorax arched; præscutum moderately long, narrowly rounded cephalad. Wings hyaline, about two and a half times as long as broad, acute at apex; R+M+Cu and R very heavy and margined with black; anal angle narrowly black or brown; Rs short; M and Cu sometimes slightly petiolate; marginal cells subequal.

Genitalia.—Male.—Forceps (from side) scythe-shaped, with sharp edge cephalad; (from behind) swollen on basal half, apical half abruptly very slender and acuminate, arcuate outward, pubescent; anal valve short, with a long posterior lobate process from apical half at right angles to axis of valve. *Female.*—Genital segment short, not much longer than preceding segment, dorsal valve a little longer than ventral, subacute.

Described from eight males and females from: Claremont, California (C. F. Baker), Laguna Beach, California (Baker); Los Angeles, California (Coquillett); Argus Mountains, California (Koebele), April; Boulder, Colorado (S. A. Rohwer), on *Salix rostrata* (*bebbiana*), May 2, 1908.

Type in author's collection. The three specimens in the collection of the U. S. National Museum bear the label *Trioza ichneumonia* Riley, a manuscript name.

CEROPSYLLA JOHNSONII Crawford.

Figs. 156, 158, 498.

Triozoida johnsonii CRAWFORD '11b: 492.

Length of body 2.2 mm; length of forewing 3; width of head 0.78. General color light brown; vertex shining black; præscutum brown; hind legs light brown, others dark or black.

Head moderately broad, not quite as broad as thorax, scarcely punctate; postocellar regions unusually elevated; vertex smooth between posterior ocelli, roundly bulging in front and less emarginate at median line than in *californica;* anterior bulging less acute than in *sideroxyli* and more so than in *californica;* genal cones nearly as long as vertex, conspicuously separated from base to apex, vertical, blunt at tip, sparsely pubescent; with the elongated clypeus extending downward and visible behind and between cones, as long as latter and appearing as a third cone. Eyes large. Antennæ about twice as long as width of head, inserted almost directly in front of genal cones instead of at the side as in most other species of the family.

Thorax strongly arched; pronotum and præscutum rather stout. Wings transparent, almost three times as long as broad, slender, acute at apex; basal vein not as heavy as in *californica;* M and Cu distinctly petiolate; Rs short; second marginal cell much larger than first.

Genitalia.—*Male.*—Forceps almost as long as anal valve, simple, converging uniformly from base to tip, arcuate, toothed at apex, rather densely pubescent; anal valve with a short, subacute lobate process caudad from subapical portion of axis, pubescent.

Described from one male collected at Belize, British Honduras, by J. D. Johnson. No other data are given.

Type in author's collection.

This species, in general, is more closely related to *sideroxyli* than to *californica*, but in wing characters it is more closely related to the latter.

HEMITRIOZA, new genus.

Head much narrower than thorax, deflexed; vertex not raised platelike; genal cones not long, divergent; clypeus small. Eyes very small. Antennæ not more than twice as long as width of head. Thorax arched quite strongly; pronotum short, depressed below level of head and præscutum, descending strongly cephalad; propleurites as in *Trioza*. Hind tibiæ with three apical spines within and one outside; basal tarsus of hind legs without apical clawlike spines. Wings short, membranous; media and cubitus often with a long or short petiole or without one (varying on wings of individual); basal vein long. Male often much smaller than female.

Type of genus.—*Hemitrioza sonchi*, new species.

This genus is distinctly *triozine* in general form, but in wing venation it approaches *Psylla*. Its position seems to be more or less intermediate between *Psylla* and *Trioza*, hence the name.

HEMITRIOZA SONCHI, new species.

Fig. 402.

Trioza sonchi RILEY (*nomen nudum*), Proc. Amer. Ass. Adv. Sci., 32:319.—AULMANN 13:55.

Length of body, 1.7 mm; length of forewing, male, 2; female, 2.5. General color, red to orange; antennæ white, black at tip; beak black; fore and middle tibiæ and all tarsi whitish; wings with a broad reddish band across the middle and three spots on hind margin. Head and thorax coarsely punctate. Male much smaller than female.

Head rather small relatively; vertex more than half as long as broad, with a large foveal depression on each side of median line, emarginate in front over ocellus; genal cones not quite as long as vertex, broad at base, subacute, widely divergent, subvertical, pubescent. Eyes very small. Antennæ about twice as long as width of head, III thicker than succeeding segments.

Thorax rather strongly arched, broad; pronotum short; scutum large. Wings hyaline, relatively short, about twice as long as broad, conspicuously colored as described above; petiole of media and cubitus variable in length even on wings of an individual; radial sector very short; marginal cells subequal. Hind wings very small.

Genitalia.—*Male.*—Forceps about half as long as anal valve, thick at base and converging to apex to a sharp toothlike point, arcuate somewhat; anal valve rather large, elliptical (from side view), broadest at middle; forceps and anal valve quite densely pubescent.—*Female.*—Genital segment short, a little longer than preceding segment, dorsal valve longer than ventral.

Described from three males and two females from Virginia, October 9, 1881, on *Sonchus arvensis;* one male and three females from Washington, District of Columbia (E. A. Schwarz), June; many males, females, and nymphs from Atlanta, Georgia (J. C. Bradley), July 6, 1909.

Type.—Cat. No. 18094, U. S. Nat. Mus.

The nymph of this species is distinctly *triozine* in form, being bordered completely by a dense fringe of long, white, hair-like processes, so characteristic of *Trioza* species.

Subfamily PSYLLINÆ.

Head more or less deflexed, sometimes perpendicularly so; vertex quadrate, semicircular, or subtriangulate; genæ produced into variously shaped lobes or cones beyond end of vertex; frons covered by genæ, visible only as a very small sclerite bearing front ocellus. Antennæ typically ten-segmented, long or short. Thorax usually well arched; sclerites of thorax variable, as described under tribes and genera. Hind tibiæ often with a spur at base, with five to twelve black spines at apex; basal tarsal segment of hind legs with a pair of black claw-like spines at apex. Wings variable from thick to hyaline, rhomboidal to elongate-ovate, seldom, if ever, ovate *and* at the same time acutely angled at apex, as in *Trioza;* media and cubitus always with a petiole.

There are grouped in this subfamily several genera not heretofore associated together. Several genera formerly placed in Aphalarinæ have been transferred to this group because of obviously close relationships one to another. The relative length of the cubital petiole (M+Cu) and the discoidal subcosta (R) has been the basis for separating certain of these genera into one or the other of Aphalarinæ or Psyllinæ, but this character is of little value and often separates widely two closely related species, or even two specimens of the same species.

A comparison of forms at opposite ends of the subfamily series does not show any apparently close similarities, and yet with the many intermediate forms before us, we readily see the inter-relationships and similarities of the various genera. The group has been, for convenience, divided into four tribes: Pachypsyllini, Euphyllurini, Arytainini, and Psyllini.

The principal and most distinctive characters of this subfamily are the concealed frons, the presence of genal cones or lobate processes, the presence of the apical claw-like spines on the posterior basal tarsus (not limited, however, to this group), and the presence of a cubital petiole (M+Cu). The following synoptic table shows the relationships of the tribes and genera to each other to a certain extent.

SYNOPSIS OF GENERA.

a^1. Vertex quadrate, flat, very large, perpendicularly inclined, or nearly so; wings seldom ovate .... Tribe *Pachypsyllini*.

  b^1. Praescutum, pronotum and vertex perpendicularly inclined; wings very long, rhomboidal, subhyaline .... *Uhleria*, new genus.

  b^2. Only the head and sometimes the pronotum perpendicularly inclined.

    c^1. Wings subhyaline, not rhomboidal; antennae distinctly longer than width of head; genal cones rather large .... *Tetragonocephala*, new genus.

    c^2. Wings thick, opaque, more or less rhomboidal; antennae short; genal cones small; vertex often not quite perpendicular, broadest at apex; insects gall-forming .... *Pachypsylla* Riley.

a^2. Vertex not quadrate, narrowed distinctly anteriorly, not perpendicularly inclined, but sometimes strongly descending.

  b^1. Forewings strongly rhomboidal, usually thickened and opaque; vertex flat; genae produced into two transverse contiguous lobes on same plane with vertex. Tribe *Euphyllurini*.

    c^1. Head and pronotum vertically inclined; eyes not covering propleurites; wings only semiopaque; dorsal head and thorax pubescent. *Katacephala*, new genus.

    c^2. Head deflexed, but not perpendicularly inclined; eyes receding strongly, covering propleurites; wings opaque; head and thorax not pubescent. *Euphyllura* Förster.

  b^2. Forewings elongate-ovate, sometimes with a rhomboidal tendency (see *Euphalerus propinquus*), usually hyaline or subhyaline, rarely opaque; genal cones not as above.

    c^1. Pleural suture of prothorax extending to middle of lateral extremity of pronotum, which is more or less swollen and knob-like; propleurites subequal in length (see fig. 1) .... Tribe *Arytainini*.

      d^1. Vertex large, flat, more or less as in *Euphyllura*, with eyes strongly recessive; genal cones with vertex forming a uniformly flat surface; wings often subopaque .... *Euphalerus* Schwarz.

      d^2. Vertex smaller, less flat, with eyes less recessive; genal cones not as above; wings usually subopaque to hyaline.

        e^1. Genal cones rounded at apex, not acutely conical, more or less parallel to plane of vertex; vertex bulging on each side of median line; thorax usually less strongly arched .... *Arytaina* Förster.

        e^2. Genal cones acutely conical, perpendicularly inclined; vertex not bulging in front on each side of median line; antennae rather long; wings hyaline; thorax well arched .... *Psyllopsis* Loew.

    c^2. Pleural suture of prothorax extending obliquely to posterior part of lateral extremity of pronotum, or not attaining to it at all; episternum longer than epimeron .... Tribe *Psyllini*.

      d^1. Vertex with a longitudinal, whitish ridge along each side of median line, with a furrow outside of and between the two ridges; genal cones short and usually separated at base; antennae long.... *Mitrapsylla*, new genus.

      d^2. Vertex without such ridges and furrows; genal cones various, usually conical .... *Psylla* Geoffroy.

Tribe PACHYPSYLLINI.

UHLERIA, new genus.

Head, pronotum, and praescutum perpendicularly inclined, with mesothorax exceedingly thick dorso-ventrally and anterior part of head about on same level with the ventral surface of mesothorax;

vertex very large, flat, square; genal cones small, subconical, flexed outward. Thorax very large; pronotum short; mesonotum ascending vertically to scutum, coarsely punctate. Legs thick. Wings very long, subhyaline, rhomboidal; cells long and narrow.

Type of genus.—*Uhleria mira*, new species.

This is a very aberrant and unusual genus, showing, however, marked relationships to other *Pachypsyllini* genera.

UHLERIA MIRA, new species.

Figs. 114, 115, 411.

Length of body 3.9 mm.; length of forewing 4.2; width of head 1.05. General color brown, variegated with flavous; an indefinite flavous stripe extending up each side of vertex over pronotum and on each side of praescutum, and meeting at posterior side of latter and extending as one median stripe over scutum; pleuræ variegated. Body very large.

Vertex nearly square, very slightly broader than long, with a shallow fovea on each side of median line, coarsely punctate; genal cones about one-fourth as long as vertex, flexed outward, rather acute at tips, slightly pubescent. (Antennæ broken off.)

Thorax very large, coarsely punctate. Pronotum short, broader at lateral extremities; praescutum relatively small. Mesoscutum exceedingly large, strongly arched. Wings about three times as long as broad, flavous and somewhat thickened, subhyaline or semi-opaque; posterior apical margin angulate; marginal cells very elongate and narrow; pterostigma rather large.

The genitalia of the single specimen (apparently a female) before me have been removed. The abdomen is very large at base and converges to a small apex.

Described from one female with no locality data, in the United States National Museum collection. It is probably an American species, however.

Type.—Cat. No. 18095, U. S. Nat. Mus.

This is such a remarkable and interesting species that it has seemed worth while to describe it, even without any locality data, in the hopes that future collecting will bring to light additional specimens. The name given to this species is that applied, in manuscript, to the same insect by Riley. It was apparently named after Dr. Philip Uhler.

TETRAGONOCEPHALA, new genus.

Head, and sometimes pronotum also, perpendicularly inclined; vertex flat, quadrate, rarely converging slightly toward front; genal cones rather large. Thorax strongly arched; pleurites of pronotum rather broad. Wings subhyaline, more or less elongate-ovate, cells long and narrow; pterostigma wanting.

Type of genus.—*Tetragonacephala flava*, new species.

TETRAGONOCEPHALA FLAVA, new species.

Figs. 128, 129, 418.

Length of body 2.7 mm.; length of forewing 4; width of head 0.92. General color flavous, with seven small black spots on mesonotum; antennæ black at tip.

Head vertical; vertex large, almost square, flat, punctate; genal cones about half as long as vertex, slightly divergent, rounded at apex, a little longer than broad in same plane with vertex. Antennæ about one and a third times as long as width of head, slender. Thorax strongly arched, punctate; pronotum moderately long, ascending. Legs long, a little longer than in *Katacephala*. Wings long, about two and a half times as long as broad, hyaline, scarcely rhomboidal, broadly rounded at apex; marginal cells long and narrow; pterostigma wanting.

Genitalia.—Male.—Genital segment partially retracted into preceding segment, very hairy; anal valve very large and broadly ovate, from caudal aspect; forceps long, gradually enlarging toward apex, with apical fourth converging again to a point; with long hairs on caudal surface.

Described from one male from Brownsville, Texas (H. S. Barber), May 13, 1904.

Type.—Cat. No. 18096, U. S. Nat. Mus.

Genus PACHYPSYLLA Riley.

Pachypsylla Riley '83:71.

Dorsum strongly arched; body robust. Vertex very large, almost square, flat except apical margin rounded down, nearly or quite perpendicularly inclined. Genal cones small, subconical, divergent. Antennæ short, seldom longer than width of head. Thorax large and broad; propleurites broad. Legs rather short. Wings more or less rhomboidal, often only slightly so, thickened, variously colored and maculated; marginal cells long and narrow; pterostigma present; veins usually setigerous.

Type of genus.—*Pachypsylla venusta* Osten Sacken.

This is a very interesting genus, whose distribution seems to be limited to the United States. The members are gall-makers on several species of hackberry (*Celtis* spp.), and apparently on no other plants.

SYNOPSIS OF SPECIES.

a^1. Body very large; length to tip of folded wings over 5 mm.; wings maculate apically. Gall large, spherical, polythalamous, on twigs or petioles..*venusta* Osten Sacken.

a^2. Length not over 4 mm. to tip of folded wings. Gall smaller, monothalamous.

  b^1. Vertex and thoracic dorsum pubescent; forewings scarcely rhomboidal, about two and a half times as long as broad, with a subapical, oblique, whitish band. Galls on leaves.

- c^1. Body moderately large, seldom less than 3 mm. long to tip of folded wings. Gall mammiform, on under side of leaf, more or less pubescent, concave on upper side of leaf.......................................*c.-mamma* Riley.
- c^2. Body small, seldom over 2.5 mm. to tip of folded wings; gall blister-like on both sides of the leaf, raised only slightly above surface of leaf. *c.-vesiculum* Riley.

b^2. Vertex and dorsum not pubescent; forewings more rhomboidal, not much over twice as long as broad, more or less wrinkled. Galls on petioles or small twigs.

- c^1. Pterostigma indistinct, not black; head and thorax more or less flavous.
  - d^1. Forewings uniformly brownish..............................*c.-gemma* Riley.
  - d^2. Forewings finely mottled in apical portion....................*dubia* Patch.
  - d^3. Forewings mottled and spotted, with an oblique, clear band subapically. *pallida* Patch.
- c^2. Pterostigma black, prominent; head and thorax black, marked with flavous; marginal cells less narrow than in other species, the first shorter and more V-shaped than second; antennæ black; wings with a smoky band along anal and apical margins and extending along branching of veins toward base. Galls oblong-oval, located on twigs or base of larger limbs just beneath the bark. *inteneris* Mally.

The following species are too closely related to *c.-mamma* and *c.-vesiculum* to be easily distinguishable and have not been included in the synopsis:

c.-asterricus RILEY '90:618.—TUCKER '07:69.
c.-cucurbita RILEY '90:621.—BEUTENMÜLLER '92:276.—STEBBINS '10:33.
c.-globulus RILEY '90:621.
c.-minuta RILEY (MS?).—TUCKER '07:69.
c.-pubescens RILEY '90:620.
c.-umbilicus RILEY '90:619.
rohweri COCKERELL '10:180.

PACHYPSYLLA VENUSTA Osten Sacken.

Figs. 65, 66, 255, 451.

Psylla venusta OSTEN SACKEN '61:422.
Pachypsylla venusta RILEY '83:72.—BEUTENMÜLLER '92:274.—MALLY '93:137.
Pachypsylla c.-grandis RILEY '83:70.
Pachypsylla tridentata PATCH '12b:224.

Length of body 4.4 mm.; length of forewing 5.1; width of head 1.2. General color brown to brownish yellow, often more or less variegated with darker brown; thorax with longitudinal stripes. Body very large and massive.

Head vertical, large, with eyes much narrower than thorax; vertex very coarsely rugoso-punctate, straight on posterior margin, not converging toward front, rounded forward between anterior ocellus and posterior margin but not between eyes, quite coarsely pubescent, with a small fovea on each side of median line, otherwise plane; anterior margin slightly arcuate. Genal cones short, small, subacute at apex, projecting slightly forward from plane of vertex and sharply depressed and separated therefrom, distinctly divergent, slightly pubescent. Eyes large, extending back over propleurites; anterior ocellus large, prominent. Antennæ short and stout.

Thorax very large and robust, broad, very strongly arched, very coarsely punctate and pubescent. Pronotum long, subvertical, extending laterad to middle of eyes; lateral margin straight; propleurites rather long. Præscutum large, arched rather strongly. Wings very large, whitish and partially subhyaline, maculate; about two and a half times as long as broad, rhomboidal, rather acute at apex; costal margin nearly straight; marginal cells long, first longer and larger than second, of similar shape; pterostigma long, distinct, almost as long as subcostal cell; basal vein elevated on a distinct callus; veins set with a double row of setæ.

Genitalia.—*Male.*—Genital segment large, conspicuous; forceps relatively not long, simple, stout, tapering to apex. Anal valve long, front margin arcuate, posterior margin bulging roundly over middle two-thirds, emarginate subapically; pubescence long. *Female.*—Genital segment fully as long as rest of abdomen, or slightly longer, acute at apex, narrow; dorsal valve longer than ventral.

Described from several males and females from Dallas, Texas (E. S. Tucker); Colorado (Gillette); Kansas (no data). An examination of a paratype of Miss Patch's *P. tridentata* shows it to be identical with *venusta;* "Cañon City, Colorado, on *Celtis*," is the data accompanying her description of this species.

The gall is large and spherical, about 1 cm. in diameter, woody, polythalamous; found on twigs and petioles of *Celtis occidentalis.*

PACHYPSYLLA C.-MAMMA Riley.

Figs. 64, 242, 482.

Pachypsylla celtidis-mamma Riley '76:425; '83:73; Canad. Ent. 15:158.—Packard '90:619.—Beutenmüller '92:275; '04:35.—Cook '03:426; '04:844.—Jarvis '06:65.—Stebbins '10:33.—Mally '93:131-138; Stough '10:121-165 (anatomy).

Length of body 2.4 mm.; length of forewing 2.8; width of head 1.04. General color reddish brown to light brown, very little variegated. Body moderately large, robust.

Head large, not as broad as thorax; vertex straight on posterior margin, somewhat rugoso-punctate, not converging toward front, rounded downward toward front, finely pubescent, with a small fovea on each side of median line in rear center; genal cones short, small, subacute, divergent, extending slightly forward from plane of vertex and depressed and separated therefrom.

Thorax large, very broad and strongly arched, coarsely punctate and pubescent. Pronotum long, not quite vertical, lateral margin straight, short; propleurites rather short; praescutum long and broad. Wings moderately large, whitish, scarcely hyaline, covered with numerous small impunctations over entire surface, each spot covering from three to five impunctations; with a band nearly free of spots extending from near tip of Rs obliquely to tip of Cu_2; about two and a half times as long as broad; first marginal cell smaller than second; veins with a double row of setæ.

Genitalia.—*Male.*—Genital segment rather elongate; forceps not long, simple, slightly tapering to tip; anal valve long, similar in shape to *P. venusta*, arcuately bulging on hind margin and emarginate subapically. *Female.*—Genital segment about as long as rest of abdomen, similar in shape to that of *venusta*.

Described from many males and females from Ames, Iowa (C. W. Mally); Kansas (no data); Colorado (no data); several points in Texas: Plano (E. S. Tucker), October, November; Wills Point (F. C. Bishopp), March 15, 1904; Dallas, November to March; Ithaca, New York, 1893.

In the Fifth Report of the U. S. Entomological Commission (1890), pages 614–622, Riley describes the galls of several species of this genus. The adult insects of some of these species he has described in another paper, but for several closely related to *c.-mamma* he has described nothing but the gall. No authentic specimens of his species *c.-asteriscus*, *c.-umbilicus*, *c.-pubescens*, *c.-globulus*, *c.-cucurbita* and *c.-cucurbita* var ?, are available, and therefore, with no description of the insect extant, nothing can be done at present, except to disregard these species until some knowledge of them is obtained. In all probability, all of these species are only variations of the species *c.-mamma*, since the insects are said to be very similar and the differences in the galls are not great. In the collections at hand there are large numbers of specimens belonging to and closely related to this species, forming a large series more or less continuous in variation. In all this series there are almost no structural differences at all, the only variations being in size of body and maculation of wings. The size of the body varies almost continuously from somewhat larger than the size given for *c.-mamma* to almost as small as *c.-vesiculum*. The spotting of the forewing varies in intensity within certain limits, but always the oblique, white band is present apically; the margins of this band are often darker than the rest of the wing surface, and sometimes a very dark band about as broad as the light band borders the latter on the inside. Although there exist in the series at hand several interruptions in continuous variation it is quite probable that more extensive collections will fill these gaps and demonstrate that this is a very widely variable species, instead of many species as stated by Riley.

In a large collection of galls one notices many variations in form and size. It is this fact that has given rise to many of the species listed above. After much careful study Mally ('93:136) has stated that these gall variations have no specific significance. He describes a wide range in form variation from the typical perpendicular, mammiform gall to a short, rounded gall without the nipple, or even concave at the end. He further states that a great many of these different galls were placed singly in pill boxes and the adults bred out. With a few possible exceptions, all the adults thus bred out were typical *c.-mamma*. A few he thought might be varietal forms. He concludes, and correctly I believe, that gall variations such as are described above have little or no specific significance. These several species listed above are therefore either identical with *c.-mamma* or are varietal forms of it.

PACHYPSYLLA C.-VESICULUM Riley.

Figs. 63, 241, 292, 454.

Pachypsylla celtidis-vesiculum Riley '83b: '90:618.—Beutenmüller '92:275; '04:35.—Jarvis '06:65.—Stebbins '10:33.

Very close to *c.-mamma*, differing as follows: Much smaller, about 2 mm. long to tip of folded wings, rarely over 2.5 mm., less robust; similar in general coloration except genal cones distinctly lighter than vertex; head usually less perpendicular. Genitalia relatively smaller. Wing venation not exactly similar (see figure). *Galls* distinctly different, blister-like and similar on both sides of leaf, never mammiform or elongate; often scarcely raised above surface of leaf.

Described from many males and females from Ames, Iowa (Mally), and from Ithaca, New York (Crawford), bred from *Celtis* galls, October, 1912.

PACHYPSYLLA C.-GEMMA Riley.

Figs. 67, 243, 453.

Pachypsylla celtidis-gemma Riley '83:74.—Beutenmüller '92:275.—Mally '93:138.

Length of body 3.2 mm.; length of forewing 3.3; width of head 1.2. General color yellowish brown, variable in shade; head and thorax dirty yellow with a tinge of brown. Body moderately large, robust, surface glossy, not pubescent.

Head almost vertical, much narrower than thorax; vertex large, straight on posterior margin, not converging toward front, not pubescent as in preceding species, with a shallow fovea on each side of median line, punctate; genal cones small, short, rounded apically, projecting outward and slightly forward from plane of vertex, sharply depressed and separated therefrom, divergent, pubescent. Antennæ very short, scarcely as long as width of head.

Thorax very large, massive, strongly arched, glabrous and very finely punctate. Pronotum not very long, almost vertical, lateral margin straight. Wings broad, large, rather rhomboidal, light brown throughout, coriaceous, about twice as long as broad, sides subparallel basally, rhomboidal apically, rather narrowly rounded at apex; marginal cells shorter than in typical species, but of similar form, first shorter than second; pterostigma short, indistinct; veins with double row of setæ; one specimen presents the anomaly of the entire absence of the second marginal cell in one forewing and the reduction of it to a very small cell in the other.

Genitalia.—*Male.*—Genital segment short; forceps rather small, simple; anal valve rather large, tapering roundly to apex on both margins. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve longer than ventral.

Described from several males and females from Brownsville, Texas (Jones and Pratt), on *Celtis*, March 20, 1906; Corpus Christi, Texas (F. C. Pratt), April 13, 1906; Natchitoches, Louisiana (Cushman, and Pierce), on *Cratægus*, March 28, 1907; Cadet, Missouri, May, 1885; Des Moines River, Iowa (Mally); Virginia; Washington, District of Columbia (Schwarz), June 1. The record on *Cratægus* is the only instance of any member of this genus occurring on anything except *Celtis*.

This and the three following species differ from the others in having the body smooth instead of pubescent, but this scarcely warrants the recognition of a subgenus or a distinct genus, although Riley did place *c.-gemma* in the subgenus *Blastophysa*.

PACHYPSYLLA DUBIA Patch.

Pachypsylla dubia PATCH '12b: 224.

I have examined a paratype of this and the following species and both seem to be distinct from *c.-gemma*, though closely related. The chief difference is in the mottled appearance of the forewing instead of being uniformly brown.

Seven paratypes in the collection of Cornell University, but the locality is not given for any of them.

PACHYPSYLLA PALLIDA Patch.

Pachypsylla pallida PATCH '12b: 225.

Similar to *c.-gemma* in characters of head and thorax and shape of wings; color of wings somewhat resembling that of *c.-mamma*, with a clear, transverse, oblique band subapically and spotting on each side of band; this color, however, is less marked than in *c.-mamma*.

Described from one paratype from Arizona (no data).

PACHYPSYLLA INTENERIS Mally.

Pachypsylla inteneris MALLY '93: 138.

Closely related to *c. -gemma*, but differing in color and venation, as described in synoptic table. The characterization there is taken almost verbatim from Mally's short description, and it need not be repeated here. I have seen no specimens of this species.

Locality.—Ames, Iowa (C. W. Mally), on *Celtis* sp.

Tribe EUPHYLLURINI.

The most characteristic features of this tribe are the rhomboidal wings and the form of the genal lobes in front of the vertex. Two species of a new genus, *Katacephala*, are closely enough related to *Euphyllura* to be included in the same tribe although there are marked differences between the two.

It is interesting to note that *Katacephala* bears certain marked resemblances to the Pachypsyllini, while *Euphyllura* grades off into *Euphalerus* on the other side. With these intermediate forms before us it is easy to see the relationships of the various genera of this subfamily.

KATACEPHALA, new genus.

Head and pronotum perpendicularly inclined; vertex large, converging roundly toward front; genal lobes transverse, contiguous on inner margin, thicker than in *Euphyllura*, scarcely differentiated from vertex. Antennæ not much longer than width of head. Vertex and thoracic dorsum conspicuously pubescent. Thorax broad, and strongly arched. Legs very short. Wings rhomboidal, but much more hyaline than in *Euphyllura;* venation similar to latter; veins setigerous.

Type of genus.—*Katacephala grandiceps*, new species.

SYNOPSIS OF SPECIES.

*a*¹. Wings very strongly rhomboidal; antennæ not longer than width of head; head not retrose.......................................*grandiceps*, new species.
*a*². Wings with rhomboidal angles more rounded; antennæ distinctly longer than width of head; head retrose.............................*arcuata*, new species.

KATACEPHALA GRANDICEPS, new species.

Figs. 120, 121, 126, 127, 416.

Length of body 2 mm; length of forewing 2.7; width of head 1. General color brown to yellowish brown; eyes and genal lobes of male dark brown to black. Entire body surface clothed with a conspicuous pubescence. Body very stout, not large.

Head vertical, lying closely against prothorax and forecoxæ, as broad as thorax; vertex broader than long, anterior margin roundly arcuate, with an arcuate fossal depression parallel with front margin reaching about half way to the front. Genal lobes large, very thick, rounded in front, broader than long, lying against forecoxæ. Antennæ inserted between eye and genal lobe, about as long as width of head, black at tip. Eyes touching mesopleuræ; anterior ocellus at base of genal lobes, apparently remote from front margin of head.

Thorax broad, high; pronotum mostly covered by eyes; præscutum, scutum, and scutellum very large; pleurites large. Wings rhomboidal, semi-hyaline, slightly rugulose, almost twice as long as broad; pterostigma very long and narrow; marginal cells long, triangular; veins setigerous.

Genitalia.—*Male.*—Genital segment small. Forceps slender, simple, as long as anal valve, curved inward at apex, acute; anal valve slender, posterior margin sinuate. *Female.*—Genital segment as long as rest of abdomen, stout, dorsal valve a little longer than ventral.

Described from one pair collected on Long Island, Bahamas, by E. A. Schwarz, April, 1879, and one pair from Key West, Florida (Schwarz).

Type.—Cat. No. 18097, U. S. Nat. Mus.

KATACEPHALA ARCUATA, new species.

Figs. 61, 62, 450.

Length of body 2.9 mm.; length of forewing 3.6; width of head 1. General color brown throughout. Body quite large, very pubescent.

Head moderately large, vertical, not visible from above, retracted or retrose, not as broad as thorax, pubescent, punctate; vertex rounded, without foveæ, straight on posterior margin, converging from middle of eye to front ocellus. Genal lobes moderately large, contiguous on inner margin, broad, not depressed below plane of vertex, pubescent. Clypeus scarcely visible between head and forecoxæ. Front ocellus large, round, prominent. Antennæ longer than in preceding species.

Thorax unusually arched, broad, large, densely pubescent. Pronotum very long, vertical, in same plane with vertex and almost as long. Præscutum very large, more or less horizontal. Wings large, subhyaline, maculate on hind margin from margin to media, darker in second marginal cell, about two and one-third times as long as broad, rather angulate at apex, semi-rhomboidal; basal costa very thick, densely pubescent; all veins with a double row of setæ; marginal cells elongate, first longer than second; pterostigma long, pubescent.

Genitalia.—*Female.*—Genital segment about as long as rest of abdomen, similar in shape to *Pachypsylla;* dorsal valve longer than ventral.

Described from one female collected at Jalapa, Mexico (D. L. Crawford), August 28, 1910.

Type specimen in author's collection.

Genus EUPHYLLURA Förster.

Euphyllura FÖRSTER '48: 93.

Body very robust, strongly arched, coarsely punctate, often more or less spotted. Head deflexed strongly, large, flat, as broad as thorax; vertex large, usually rather flat; genal lobes rectangular in shape and about as broad as vertex and not depressed from the level of vertex, contiguous on inner margin and either conjointly truncate or separately rounded slightly in front; anterior ocellus at base of genal lobes, apparently remote from front margin of vertex. Eyes large, strongly recessive and covering propleurites. Antennæ short, thick. Pronotum extending far down laterad to a point lower than base of forewings; propleurites short. Wings rhomboidal, coriaceous, not transparent, apex near anterior margin; second marginal cell often elongate.

Type of genus.—*Euphyllura phillyræ* Főrster, a European species.

SYNOPSIS OF SPECIES.

a^1. Vertex very deeply emarginate over insertion of antennæ, with a prominent, rounded projection between emargination and front margin of eye; wings strongly rhomboidal.

b^1. Wings brown, thick, transversely wrinkled; costa somewhat sinuate. *arctostaphyli* Schwarz.

b^2. Wings white, rather powdery, sculpture concealed; costa not sinuate. *arctostaphyli neveipennis* Schwarz.

a^2. Vertex not emarginate over antennal insertion, or if so, not deeply; prominent projection wanting; wings rhomboidal, but not strongly so.

b^1. Forewing bicolored, brown basally and light apically; forceps of male very slender, emarginate near apex on front margin, without tooth on hind margin; genal lobes moderately long............................*arbuti* Schwarz.

b^2. Forewings uniformly brown; forceps of male rather stout, not emarginate at apex, with a distinct tooth on posterior inner margin about one-third the length from apex; genal lobes short.................*arbuticola*, new species.

EUPHYLLURA ARCTOSTAPHYLI Schwarz.

Figs. 32, 34, 279, 431.

Euphyllura arctostaphyli SCHWARZ '04:235.

Length of body 2.2 mm; length of forewing 3; width of head 1.18. General color reddish brown, varying from light to very dark, more or less conspicuously spotted; head and thorax reddish brown or brownish yellow; abdomen blood red; legs yellowish; forewings dark brown with a reddish tinge, more or less maculated with whitish, often with a prominent white fascia at basal third and sometimes a whitish area or fascia subapically.

Head as broad as thorax, strongly deflexed, rugose-punctate; vertex broader than long, emarginate over insertion of antennæ, nearly straight on posterior margin; genal lobes a little less than half as long as vertex, rectangular in shape, scarcely separated from vertex. Antennæ short. Eyes large; ocelli small.

Thorax very broad and strongly arched, less rugose than vertex but very coarsely punctate. Pronotum half as long as præscutum, ascending, covered laterad by receding eyes; scutum strongly convex. Wings thick, coriaceous, transversely rugose and rugulose, opaque, more or less maculated and not wholly constant in color, more rhomboidal than in *arbuti*, sides parallel to apical third, about twice as long as broad; marginal cells subequal; veins not sinuate; radial cell large.

Genitalia.—Male.—Anal valve long, slender, simple, a little longer than forceps, posterior edge concave, pubescent; forceps long, widening slightly toward apex, rounded at apex; posterior view shows forceps thin and subspatulate apically, densely fringed with hairs on inner margin. *Female.*—Genital segment moderately long, dorsal valve longer than ventral, margin regular, both acutely pointed.

Described from 12 males and females from Placer County, California (paratypes), collected by A. Koebele on *Arctostaphylus pungens*, September and October; several from Marble Valley, California (Koebele), July; Siskiyou County, California (Koebele); Oracle, Arizona (Hubbard and Schwarz); Colorado (Gillette); Easton, Washington (Koebele); and Big Horn Mountains, Wyoming (C. W. Metz), August.

Type.—Cat. No. 8143, U. S. Nat. Mus.

EUPHYLLURA ARCTOSTAPHYLI NEVEIPENNIS Schwarz.

Euphyllura arctostaphyli var. *neveipennis* SCHWARZ '04:235.

Form and structure similar to species; color variable, as in species; wings snow-white, sometimes with brown spots on apical margin, surface rather white-pulverulent in appearance, venation somewhat obscured. Genitalia somewhat similar, but forceps with the inner ridge and fringe of hairs much less conspicuous.

Described from nine specimens from Placer County, California (paratypes), collected by A. Koebele together with the typical specimens of the species, and several from Marble Valley, California (Koebele); Los Angeles, California (Koebele); and Pasadena, California (Grinnel).

EUPHYLLURA ARBUTI Schwarz.

Fig. 6.

Euphyllura arbuti SCHWARZ '04: 237.

Length of body 2.3 mm.; length of forewing 3.2; width of head 1.3. General color reddish brown to yellowish brown, venter and legs lighter; wings very light brown, but dark brown to black in front of claval suture. Body moderately large, robust.

Head strongly deflexed, as broad as thorax or broader, rugose, rather shining; vertex much broader than long, slightly convex; genal lobes thick, slightly shorter than in *arctostaphyli*, not depressed below vertex, a little lighter in color than vertex, very sparsely and briefly pubescent on front margin. Antennæ a little longer than in preceding species, slender. Eyes very recessive.

Thorax very broad and strongly arched, less rugose than vertex, coarsely punctate. Pronotum as in preceding species. Wings much less rhomboidal than in *arctostaphyli*, thick, coriaceous, almost opaque, especially on darker portions, about twice as long as broad, transversely wrinkled; first marginal cell small; medial veins and radial sector sinuate; pterostigma wanting; clavus large.

Genitalia.—Male.—Anal valve long, slender, simple, about one-third longer than forceps, tip rounded; forceps slender, converging a little toward apex, posterior edge straight, anterior edge deeply emarginate near apex making the tip hook-like in appearance, pubescent. *Female.*—Genital segment longer than in preceding species, dorsal valve longer than ventral, both acute at tip.

Redescribed from eight males and four females (which are paratypes) from Santa Cruz Mountains, California (Koebele), collected on *Arbutus menziezii* during July and August.

EUPHYLLURA ARBUTICOLA, new species.

This species resembles very closely *arbuti* in most respects, including size and general color, but differs in the color of the forewing, being uniformly darker brown and not bicolored, with sometimes a lighter area across the base; the venter is darker than in *arbuti*. Body a little more rugose. Genal lobes shorter, and more squarely truncate; antennæ slightly shorter. Head and thorax similar. Wings somewhat larger, thicker, more rugose; veins even more sinuate.

The chief difference is in the male genitalia; anal valve stouter, relatively shorter; forceps distinctly thicker, without apical emargination on anterior edge, and with a distinct tooth on posterior edge inside about one-third the length from apex, broadly rounded at apex.

Described from six males and four females from Chiric Mountains, Arizona (H. G. Hubbard), on *Arbutus arizonica*, in September.

Type.—Cat. No. 18098, U. S. Nat. Mus.

Tribe ARYTAININI.

The distinctive characters of this tribe are given in the synoptic table above.

Genus EUPHALERUS Schwarz.

Euphalerus SCHWARZ '04:239.

This genus was erected in 1904 by E. A. Schwarz for the single species *nidifex* from Key West, Florida. The addition to the genus of three new species necessitates a slight revision of the original generic description.

Body robust, surface punctate. Head vertical to subvertical; vertex broader than long, sides straight between eyes, then converging to front, truncate at front margin. Genal cones large, broad, rounded at apex, more or less divergent, not depressed below level of vertex, separated therefrom by a slightly impressed line. Antennæ short, slender. Thorax very convex transversely and longitudinally; propleurites long and narrow. Wings membranous, more or less hyaline, sometimes subopaque, oblong-oval or somewhat rhomboidal.

Type of genus.—*Euphalerus nidifex* Schwarz.

SYNOPSIS OF SPECIES.

a^1. Entire body surface including legs and wings speckled with brown or black dots and spots; vertex and pronotum very finely punctate, or smooth; eyes scarcely recessive; genal cones one-half to five-sixths as long as vertex ..*nidifex* Schwarz.

a^2. Body surface not speckled with brown or black spots or dots; vertex and notum coarsely punctate; eyes more recessive over propleurites.

  b^1. Forewings conspicuously and coarsely rugose; body surface and legs orange to brown with numerous white spots; forceps of male not terminating in a long hook-like process....................................*rugipennis*, new species.

  b^2. Forewings not rugose, semihyaline, more or less maculated apically. Vertex and notum very conspicuously vermiculo-punctate or rugose; forceps of male terminating in a long hook-like process.

    c^1. Forewings oval or only very slightly rhomboidal; genal cones nearly as long as vertex; forceps of male slender...............*vermiculosus*, new species.

    c^2. Forewings distinctly more rhomboidal, more maculated; genal cones one-half as long as vertex, broad; forceps of male very stout and thick. *propinquus*, new species.

EUPHALERUS NIDIFEX Schwarz.

Figs. 38, 40, 261, 433.

Euphalerus nidifex SCHWARZ '04: 153, 239.

Length of body 1.9 mm; length of forewing 2.1; width of head 0.90. General color greenish white, speckled with brown or black spots over entire surface, including legs and wings; antennæ tipped with black on each segment; wings maculated apically and covered over entire surface with dots.

Head deflexed, not as broad as thorax, finely punctate; vertex scarcely arcuate on posterior margin, almost flat, slightly raised along median line, rounded broadly on anterior margin, slightly emarginate over front ocellus. Genal cones large, broad, very obtuse at apex, varying in length from one-half to five-sixths as long as vertex, divergent only in apical half, continuing plane of vertex. Antennæ short.

Thorax broad, strongly arched, punctate, spotted. Pronotum moderately long, flat on dorsal surface; praescutum shorter than scutum. Wings subhyaline, except maculated apically, covered with dots on veins and membrane, about two and one-seventh times as long as broad, broadly rounded at apex; first marginal cell larger than second; pterostigma large.

Genitalia.—*Male.*—Genital segment relatively large; forceps rather small, slender, arched, acute at tip; anal valve longer, sides subparallel, rounded at apex, not close to forceps at base. *Female.*—Genital segment small and short, dorsal valve slightly longer than ventral and less acute; pubescence sparse.

Described from numerous males and females from Key West, Florida, and Cayamas, Cuba (Schwarz), on *Piscidia erythrina;* these are apparently paratypes; they are labeled *Euphalerus ficus* (MS) Riley in the United States National Museum collection—apparently an earlier manuscript name for the species. One female, also, from Belize, British Honduras (J. D. Johnson).

There is a certain amount of variation in the relative length of the genal cones and in the color of the body. The specimens from Cuba have relatively longer genal cones and are more conspicuously spotted. There is an indistinct white broken stripe on the dorsum from the vertex to the metascutum which scarcely is apparent in the Florida forms, but is quite distinct in the Cuba specimens. The Belize specimen resembles most closely the Florida forms.

This species has nest-making habits.[1]

EUPHALERUS RUGIPENNIS, new species.

Figs. 134, 406.

Length of body 2 mm; length of forewing 2.1; width of head 0.81. General color yellowish orange to reddish brown, with numerous irregular white spots scattered over surface of body and legs; abdomen lighter ventrad; legs yellowish. Body medium in size to small. Body surface coarsely punctate.

Head large, as broad as thorax, deflexed strongly, subvertical; vertex slightly impressed discally, not entirely flat, front margin rounded. Genal cones large, one-half to two-thirds as long as vertex, broadly rounded, not contiguous at base, divergent, not depressed below plane of vertex, pubescence white, conspicuous. Eyes large, recessive over propleurites. Antennæ slender, less than twice as long as width of head, black distad. Clypeus small.

Thorax strongly arched, broad; pronotum moderately long; propleurites narrow; mesonotum long. Legs short, stout. Forewings somewhat thickened, semihyaline, very conspicuously and coarsely rugose, about twice as long as broad, broadly rounded at apex; pterostigma rather broad at base; radial sector sinuate.

Genitalia.—*Male.*—Genitalia resembling somewhat those of *vermiculosus;* forceps slender, somewhat three-faced, with a black, acutely pointed tip; anal valve slender, long. *Female.*—Genital segment short, thick, acute at apex.

Described from twelve males and females from Oracle, Arizona (Hubbard and Schwarz), on (?) *Acacia gregii*, July; twelve specimens from Placer County, California (Koebele), on *Ceanothus cuneatus*, in September; nine from Los Angeles County, California (Koebele), on *Ceanothus rigidus*, in May. These are labeled *Cephalopsylla rugipennis*, Riley, a manuscript name.

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[1] A discussion of which see in Proc. Ent. Soc. Wash., vol 6, 1904, pp. 153, 239.

Type.—Cat. No. 18099, U. S. Nat. Mus.

The California specimens are uniformly a little smaller, lighter in color, and the forewings are a little less rugose. There seem to be no structural differences, however. One specimen of the Arizona lot is somewhat distinct in a few minor respects and seems to represent a varietal form of the species.

EUPHALERUS RUGIPENNIS IMMACULATUS, new variety.

Similar to the species in most respects; body surface finely punctate or very finely rugose, without white spots so characteristic of the species; genal cones about half as long as vertex, less pubescent.

Described from one female from Oracle, Arizona (Hubbard and Schwarz).

EUPHALERUS VERMICULOSUS, new species.

Figs. 39, 41, 225, 434.

Length of body 2.1 mm; length of forewing 2.4; width of head 0.98. General color greenish white; thorax darker, with numerous irregular brown spots.

Head subvertical, not deflexed below level of pronotum, long, narrow laterally, very markedly vermiculo-punctate, fully as broad as thorax; vertex flat, large, with a small but distinct fovea on each side of median line posteriorly, sides straight between eyes, then converging toward apex, truncate anteriorly; median line scarcely impressed. Genal cones large, continuous at base, slightly divergent, broadly rounded at apex, scarcely or not at all depressed below level of vertex, separated from vertex by a slightly impressed line, pubescence short. Antennæ short, with a conspicuous protuberance at base of insertion. Eyes large, recessive.

Thorax strongly arched longitudinally and transversely, coarsely punctate; pronotum vermiculo-punctate; præscutum rugoso-punctate, Pronotum long, broad, ascending; propleurites long, narrow, largely concealed behind receding eyes; scutum long, well arched. Hind tibiæ with a small tooth at base. Wings relatively small, subhyaline at base, fumate in apical third, often brown along apical margin, about twice as long as broad, very broadly rounded at apex, slightly rhomboidal; apical marginal vein often alternately white and black; marginal cells subequal; radial sector long, curved; pterostigma short, yellowish; claval suture prominent.

Genitalia.—*Male.*—Genital segment rather large; forceps slender, long, with a black, hook-like process at apex, pubescent; anal valve, large, long, broad, simple, truncate at apex, pubescent. *Female.*—Genital segment as in preceding species.

Described from one male from Claremont, California (C. F. Baker), one male from Eureka, California (H. S. Barber), on *Ceanothus* sp., in May, and numerous males and females from Placer County, California (Koebele), on *Ceanothus cordulatus*, in September, and in Siskiyou County, California. These are labeled in the National Museum collection *Cephalopsylla ceanothi* Riley (MS).

Type in author's collection.

EUPHALERUS PROPINQUUS, new species.

Figs. 131, 400.

Closely related to *vermiculosus*, but readily separated on the following characters: Head relatively broader; vertex much broader, more deeply vermiculo-punctate, without brown spots. Genal cones shorter, much broader, broadly rounded at apex, with apical portion turned outward a little. Wings somewhat rhomboidal, usually with a brown to black marginal band apically, more or less interrupted; venation similar, except Cu_1 distinctly shorter.

Genitalia.—*Male.*—Forceps stout, abruptly narrowed apically into a long, slender, hook-like process, longer than in *vermiculosus*, acute at tip and directed inward. Anal valve more rounded at apex, stouter.

Described from 13 males and females from Arizona, some of them from the Chiricahua Mountains, collected by H. G. Hubbard in September, on *Ceanothus*. These bear the label in the National Museum collection, *Cephalopsylla latifrons* Riley MS.

Type.—Cat. No. 18100, U. S. Nat. Mus.

Genus ARYTAINA Förster.

Arytaina Förster '48: 69.
Arytaena Scott '76: 528.—Loew '78: 596.
Psyllopa Crawford (n. n.) '11c: 628; '12b.

Resembling *Psylla* in many respects and sometimes difficult to distinguish therefrom; differing chiefly as follows: Genal cones usually short and very broadly rounded, seldom long and acute as in *Psylla*, extending parallel to plane of vertex but depressed below it, not widely divergent; pleurites of pronotum (see fig. 1) subequal in length, with pleural suture as in *Aphalara*. Wings usually more narrowly rounded at apex, often more or less maculated, spotted or marked, often less hyaline than in *Psylla*, but sometimes very similar to wings of *Psylla*. In other respects not differing markedly from *Psylla* in characters of antennæ, thorax except propleurites as noted above, legs including claw-like spines of basal tarsus of hind legs; basal spur of hind tibiæ seldom distinct, if present.

Type of genus.—*Arytaina genistæ* Latreille. This is the first species named in this genus by Förster and should be recognized as the type-species. There is no reason why the genus name should be spelled *Arytæna* instead of *Arytaina*, as Főrster first used the name.

SYNOPSIS OF SPECIES.

a^1. Vertex and notum not or scarcely pubescent.
  b^1. Forewings conspicuously spotted, maculated, or entirely dark.
    c^1. Wings with numerous brown spots isolated or fused to form two irregular maculæ, one apical and the other subbasal; male genitalia simple; body surface and wings often pulverulent..................*robusta*, new species.
    c^2. Wings not as above; body surface and wings not pulverulent.
      d^1. Wings entirely brown to black, thickened, not at all transparent; forceps of male bi-lobate, large; genal cones rather large. *fuscipennis*, new species.
      d^2. Wings with one or two dark maculæ; forceps of male simple.
        e^1. Genal cones large; head often broader than thorax; male anal valve simple; notum often striped.
          f^1. Wings with a longitudinal brown macula between Rs and M; forceps large, broad, thick................................*genistæ* Latreille.
          f^2. Wings clear except a conspicuous black spot at tip of clavus and sometimes a faint brown streak across base; forceps smaller, more slender; thoracic dorsum usually conspicuously striped and mottled. *ribesiæ* Crawford.
        e^2. Genal cones small; head not broader than thorax; wings with a brown band extending along posterior margin, thence toward primary furcation of basal vein; anal valve of male very large, with a large, angular posterior lobe about half as long as valve; forceps slender. *assimilis*, new species.
  b^2. Forewings not conspicuously maculated; hyaline or sometimes slightly fumate or browned apically.
    c^1. Wings more or less fumate, at least apically; body small.
      d^1. Female genital segment as long as rest of abdomen or longer; anal valve of male very broad at base, triangular in shape; forceps simple; vertex not emarginate at median line......................*minuta*, new species.
      d^2. Female genital segment very short; anal valve of male not triangular; forceps deeply bifurcate at apex, processes slender, acute, parallel; vertex emarginate at median line in front.................*chelifera*, new species.
    c^2. Wings entirely clear or nearly so; body small; genal cones very small, short; antennæ short.
      d^1. Female genital segment converging uniformly to apex, not styliform.
        e^1. Forceps of male stout, with a long, large, anterior lobate process at or near apex; wings entirely clear........................*amorphæ* Mally.
        e^2. Forceps of male slender, elongate, acute at apex, cultrate; wings sometimes indistinctly fumate at apex...............*ceanothæ*, new species.
      d^2. Female genital segment subglobose at base, with apical portion slender and styliform, very acute; genal cones as in two preceding species. *aculeata*, new species.
a^2. Head and notum conspicuously pubescent; forceps of male short and stout, with a long, slender, hook-like process at apex; wings brown at apex; vertex bulging on each side of median line in front..................*pubescens*, new species.

ARYTAINA ROBUSTA, new species.

Figs. 1, 50, 50a, 56, 236, 283, 285, 444, 445.

Length of body 1.8 mm.; length of forewing 2.3; width of head 0.95. General color very variable from greenish white to dark brown;

head often whitish or light brown with ventral surface of genal cones dark brown, or else uniformly brown to dark brown; thoracic dorsum very light to dark brown, more or less variegated; abdomen, venter, pleuræ of thorax, and legs usually distinctly darker, often very dark; forewings variable, either very light with small brown spots scattered over apical half or often the entire surface, or with these spots aggregated into a large irregular apical macula and another just below middle of wing, more or less separated, often with these maculæ very dark and more regular in outline and more distinctly separated by a transparent band. Body surface and wings often covered with a white powder which lends a whiter color to the insect and covers more or less the brown areas; very often the body and wings are glabrous without any powder or with only a slight amount. The latter are uniformly darker in general color. All these characters vary widely but gradually in a large series. Body rather small, but robust.

Head more or less deflexed, often almost vertical, sometimes less so, almost or quite as broad as thorax, punctate, often pulverulent; vertex large, broad, with a deep fovea on each side of median line discally, rounded and full on each side anteriorly, postocellar regions somewhat elevated. Genal cones rather large in comparison to some of its congenors, occasionally very large, broad at base, broadly rounded at apex or sometimes more narrowly rounded, more or less divergent, depressed below plane of vertex, briefly pubescent. Antennæ slender, about twice as long as width of head, or shorter, black apically.

Thorax broad, robust, strongly arched, often pulverulent, punctate. Pronotum rather long, more or less flat, with lateral enlargement medium to small in size; propleurites rather short. Wings relatively rather small, subhyaline, variously maculated as described above, often pulverulent, a little more than twice as long as broad, broadly rounded at apex; first marginal cell larger than second; pterostigma very small.

Genitalia.—Male.—Genital segment large; forceps slender, rather long, arched, cultrate, acute at apex; anal valve long, broadly ovate when viewed from behind, rounded acutely at apex. *Female.*—Genital segment not quite as long as rest of abdomen, acute; dorsal valve a little longer than ventral and less acute, with a tuft of long hairs midway on dorsal surface.

Described from over one hundred specimens of both sexes from the following localities: Colorado (C. F. Baker), mostly dark forms; Santa Rita Mountains, Arizona (Hubbard and Schwarz), June; Flagstaff, Arizona (Barber and Schwarz), July; Williams, Arizona (H. S. Barber), July; Chiricahua Mountains, Arizona (Hubbard), June, on *Ceanothus fendleri* (most of these are lighter forms); Placer

County, California (Koebele), September, on *Ceanothus cordulatus;* Siskiyou County, California (Koebele); Easton, Washington (Koebele).

Type in author's collection.

The species seems to be western in its distribution. The individuals of one locality show the variations mentioned above to a less extent than individuals of separated localities.

ARYTAINA FUSCIPENNIS, new species.

Figs. 51, 229, 233, 288, 447.

Length of body 1.9 mm.; length of forewing 2.2; width of head 0.99. General color dark brown, genal cones lighter in male, yellowish white.

Head rather strongly deflexed, often almost vertical, about as broad as thorax, finely punctate; vertex arcuate on posterior margin, deeply excavated discally, almost glabrous, emarginate in front at median line, and bulging roundly on each side of emargination. Genal cones short, broad, rounded at apex, contiguous at base, slightly divergent, with short pubescence. Clypeus small. Antennæ about twice as long as width of head.

Thorax large, broad, strongly arched both longitudinally and transversely; praescutum rather short. Wings broad, relatively short, about twice as long as broad, darkly fumate, scarcely hyaline, subcoriaceous, broadly rounded at apex or very slightly rhomboidal; first marginal cell large; pterostigma rather small.

Genitalia.—Male.—Genital segment large, erect; forceps bilobate, long; inner lobe more slender and acute than outer and somewhat shorter, and scarcely visible in profile; petiolate base attenuate; outer lobe large; anal valve larger than forceps, convergent distad, quite broad at base, simple; pubescence long and dense. *Female.*—Genital segment moderately long, stout, rather small; dorsal valve longer and more acute than ventral; ventral valve stout, blunt at apex.

Described from several males and females from: Redwood Creek, Humboldt County, California (H. S. Barber), on "White Myrtle," in June; Siskiyou County, California (Koebele), on *Ceanothus;* North Bend, British Columbia (Schwarz), on *Ceanothus sanguineus;* Ormsby County, Nevada (C. F. Baker); Colorado (Baker). The U. S. National Museum specimens are labeled *Euglyptoneura tristis* Schwarz, a manuscript name.

Type.—Cat. No. 18101, U. S. Nat. Mus.

ARYTAINA GENISTÆ Latreille.

Figs. 42, 227, 276, 436.

Psylla genistae LATREILLE 1810: 382.—LOEW '77:125.
Psylla ulicis CURTIS '35: 565.
Psylla spartii HARTIG, Germar Zeit. Ent., 3: 375.—FLOR '61:358.
Arytaina spartii FOERSTER '48: 69.—MEYER-DÜR '71:405.

Arytaena ulicis SCOTT '76: 529.
Arytaena genistae LOEW '78: 597; '88: 19.—SCOTT '80: 132.—REUTER '81: 162.—EDWARDS '96: 250.—SULC '05: 4.—OSHANIN '07: 366.
Psyllopa magna CRAWFORD '11c: 628.

Length of body (male) 2.1 mm.; (female) 2.5; length of forewing 3; width of head 1. General color light brown to brown; thoracic dorsum more or less distinctly striped; genal cones, and often vertex too, lighter colored; antennæ dark, fuscous at base; legs light brown to yellowish, tarsi yellowish; forewings with a brown macula between Rs and M in apical half, and a continuous or broken macula on posterior margin apically.

Head broad, often broader than thorax, not strongly deflexed; vertex large, nearly half as long as broad, with two small foveæ as usual, bulging in front on each side of median line above genal cones, somewhat emarginate at median line; genal cones nearly as long as their basal width, broadly rounded at apex and only slightly divergent, pubescent. Antennæ a little more than twice as long as width of head.

Thorax large, broad, not strongly arched. Pronotum long. Hind tibiæ with a small spur at base. Wings hyaline, maculated as described above, elongate, more than two and a half times as long as broad, narrowly rounded at apex; pterostigma small.

Genitalia.—Male.—Anal valve not much longer than forceps, simple, pubescent; forceps thick and rather large, somewhat constricted midway, apex broadened and bifurcate with a short posterior point and a longer anterior process; pubescence silky. *Female.*—Genital segment almost as long as rest of abdomen; dorsal valve longer than ventral, both acute at apex.

Described from many males and females from Woods Hole, Massachusetts (T. D. A. Cockerell), on *Spartinum* sp.

This species is widely distributed in Europe, and probably has been brought into the eastern part of this country on some nursery stock. The identity of *Psyllopa magna* with this species was not discovered until some time after the publication of the description of the former.

ARYTAINA RIBESIÆ Crawford.

Figs. 83, 84, 252, 253, 304, 306, 468, 470.

Psyllopa ribesiæ CRAWFORD '11c: 630.

Length of body (male) 2.2 mm; (female) 2.7 to 3.3; length of forewing 3 to 4; width of head 0.90 to 1.08. General color very light brown (probably the more immature specimens) to brown or dark blackish brown; thoracic dorsum with more or less pronounced stripes; vertex variable from uniform reddish brown to mottled brown and whitish; abdomen usually darker; antennæ dark; fuscous at base; legs light to dark.

Somewhat similar to *genistæ* in general size and appearance, but differing sharply in several respects. Head often broader than thorax; genal cones variable from very broad and not longer than basal width to narrower and one-third longer than basal width, only a little divergent, rounded at apex, sometimes rather narrowly rounded. Antennæ usually about twice as long as width of head.

Thorax often more strongly arched, large; hind tibiæ with basal spur smaller, or wanting. Wings large, hyaline, or sometimes with a slight brownish tinge, with a black spot at tip of clavus and sometimes a more or less distinct brown area across wing base, about two and a half times as long as broad, somewhat narrowed toward apex; venation similar to preceding species in general; pterostigma small.

Genitalia.—Male.—Anal valve much longer than forceps, somewhat narrowed toward apex; forceps rather short, slender, converging toward tip, latter subacute. *Female.*—Genital segment thick at base, usually about half as long as rest of abdomen, dorsal valve slightly longer than ventral, both acute or subacute.

Described from numerous specimens of both sexes from: Boulder, Colorado (E. Bethel), on *Ribes longiflorum;* Fort Collins, Colorado (C. P. Gillette), on *Rhus trilobata*, September 27, 1894; Poudr River, Colorado, "sweeping on low bushes," June 28, 1883; Colorado (no data); Williams, Arizona (Barber and Schwarz), July 27; Ogden, Utah (Koebele), "on currant" (*Ribes* sp.), June, 1885; Los Angeles, California (Coquillett), on *Ribes aureum*, March 28; same locality, on *Ceanothus divaricatus*, June 8, 1887; Placer County, California (Koebele), on *Ceanothus cordulatus* ?

Type in author's collection.

This species has been known more or less commonly by Riley's manuscript name of *Psylla ribis*, but this is not the same as Miss Patch's species of that name.

ARYTAINA ASSIMILIS, new species.

Figs. 57, 237, 448.

Length of body 1.9 mm; length of forewing 2.2; width of head 0.80. General color reddish brown, lighter on dorsum and head. Body rather small, long.

Head relatively rather small, deflexed quite strongly, about as broad as thorax, punctate; vertex arcuate on posterior margin, with a deep fovea on each side of median line near center, slightly bulging in front on each side of median line, not strongly elevated on postocellar regions; genal cones rather short, contiguous at base, rounded broadly at apex, slightly pubescent. Antennæ a little more than twice as long as width of head, slender.

Thorax arched strongly, robust, punctate. Pronotum rather long, flat on dorsal surface; propleurites short. Wings small, sub-hyaline, maculate in middle and on hind margin conspicuously so, semitransparent, a little more than twice as long as broad, broadly rounded at apex and apical half of wing distinctly narrowing toward apex; first marginal cell larger than second; radial sector long and curved; pterostigma long, large at base.

Genitalia.—*Male.*—Genital segment very large, about half as large as rest of abdomen; forceps moderately long, stout, roundly acute at tip; anal valve very large, larger than forceps, with a large, lobate protuberance on hind margin; pubescence short.

Described from one male from Claremont, California (Crawford), on *Ceanothus crassifolius.* This form is manifestly distinct from *A. ceanothæ,* but was taken on the same tree and together with the specimens of the other species.

Type in author's collection.

ARYTAINA MINUTA, new species.

Figs. 60, 234, 286, 446.

Length of body 1.9 mm.; length of forewing 2.4; width of head 0.88. General color light brown, abdomen darker.

Head not strongly deflexed, not quite as broad as thorax, punctate. Vertex with a fovea on each side of median line, arcuate on posterior margin, with a swollen area on each side of front ocellus. Genal cones short, rounded, broad, contiguous at base, divergent, somewhat descending from plane of vertex. Antennæ rather short, slender.

Thorax not strongly arched, coarsely punctate. Pronotum relatively rather long, with lateral foveæ prominent; præscutum short. Wings small, slender, about two and a half times as long as broad, hyaline, maculate apically, roundly acute at apex; marginal cells subequal; radial sector long, straight; pterostigma long, narrow, yellowish.

Genitalia.—*Male.*—Genital segment large, rounded; forceps moderately short, simple, curved; anal valve obtriangular, large, with the long axis anterior; pubescence sparse. *Female.*—Genital segment much longer than rest of abdomen, which is usually rather short, acute at apex; dorsal valve longer than ventral.

Described from one male and seven females collected at Claremont, California (C. F. Baker); several from Los Angeles, California (Koebele), (Coquillett), on *Ceanothus sp.*, in May.

Type in author's collection.

ARYTAINA CHELIFERA, new species.

Figs. 135, 136, 412.

Length of body 1.7 mm; length of forewing 2.3; width of head 0.84. General color greenish yellow; genitalia, tip of antennæ, and venter more or less browned; forewings very slightly fumate, browned a little darker on apical fourth. Body small.

Head moderately deflexed, almost as broad as thorax; vertex almost semicircular in outline, conspicuously emarginate in front at median line and bulging roundly on each side of this. Genal cones about one-third as long as vertex, divergent, narrowly rounded at apex, pubescent, considerably below plane of vertex but extending parallel to it. Clypeus moderately large. Antennæ not much longer than width of head, slender.

Thorax long; pronotum long and rather flat transversely; propleurites very short and small. Wings a little less than two and a half times as long as broad, broadly rounded at apex; hyaline, slightly rugose, fumate more darkly at apex.

Genitalia.—*Male.*—Genital segment rather small; forceps moderately small, deeply bifurcate at apex, the two processes slender, acute, parallel, the posterior one a little longer than the other. Anal valve small, broad at base when viewed from behind. *Female.*—Genital segment very short, dorsal valve longer than ventral, ventral very short; both acute.

Described from many males and females from Williams, Arizona (Barber and Schwarz), July; American Forks, Utah (Hubbard and Schwarz), on *Purshia tridentata*, June 23. These bear the manuscript name of *Brachypsylla purshiæ* Schwarz.

Type.—Cat. No. 18102, U. S. Nat. Mus.

ARYTAINA AMORPHÆ Mally.

Figs. 53, 235, 289, 441.

Psylla amorphæ MALLY '94:159.
Psyllopa floridensis CRAWFORD '11c:629; '12b.
Psyllopa ilicis CRAWFORD (not Ashmead) '11c: :629; '12b.

Length of body 1.4 mm.; length of forewing 1.8; width of head 0.69. General color light greenish yellow throughout. Body very small, not very robust.

Head small, deflexed, about as broad as thorax, punctate. Vertex arcuate on posterior margin, elevated on postocellar regions, with a distinct fovea and sulcate impression on each side of median line. Genal cones very short, broad, broadly rounded at apex, sharply depressed below vertex, slightly pubescent. Eyes relatively large. Antennæ short, not twice as long as width of head.

Thorax relatively long, well arched, coarsely punctate. Pronotum small, short. Præscutum long, arched. Wings small, subcoriaceous, whitish, semitransparent, not maculate, about two and two-thirds times as long as broad, sides subparallel, quite broadly rounded at apex, very slightly rhomboidal; first marginal cell a little larger than second; pterostigma long, three-fourths as long as radial sector.

Genitalia.—*Male.*—Genital segment relatively moderately large. Forceps short and thick, with a large lobate process projecting horizonatally toward anal valve from near apex; with a tooth at apex of forceps and one at about the middle of the posterior process. Anal valve long, rather broad, sides subparallel, slightly recurved. *Female.*—Genital segment not as long as rest of abdomen; dorsal valve only slightly longer than ventral, very acute at apex.

Described from seven males and females from Ames, Iowa (C. W. Mally) and four from Luverne, Iowa (Mally), and six from Westpoint, Nebraska, all on *Amorpha canescens*, from March to June. The latter specimens in the United States National Museum collection are labeled *Amblyrhina fractiforceps* Riley, a manuscript name.

After careful comparison of more specimens it seems evident that the Florida species which I erroneously named *Psyllopa ilicis* (Ashmead) in a former paper[1] is identical with *amorphae*. The Florida specimens are considerably smaller than many of the Iowa forms, but some of the latter are very small also. In structure they are very similar. If we allow for a certain amount of variation in size and minor characters, such as length of antennæ, etc., we can not recognize the two lots as even varietally distinct. The difference in food habits is interesting but not unusual. The *ilicis* species of Ashmead, according to several determined specimens in the United States National Museum collection, is neither an *Arytaina* nor an *Aphalara*, but belongs to a new genus, *Paurocephala*. (See p. 43.)

ARYTAINA CEANOTHÆ, new species.

Figs. 58, 240, 290, 442.

Length of body 1.7 mm.; length of forewing 2.3; width of head 0.70. General color yellowish to light brown to dark brown; on the darker forms the dorsum, vertex, and legs are light brownish yellow. Body very small.

Head strongly deflexed, about as broad as thorax, punctate. Vertex arcuate on posterior margin, with a deep and prominent fovea on each side and often a deep sulcate impression also, elevated roundly on postocellar regions, bulging forward on each side of median line. Genal cones very short, small, broadly rounded, much depressed below level of vertex, divergent, not always easily visible from above, slightly pubescent. Clypeus very large. Eyes rather large. Antennæ about twice as long as width of head, slender.

Thorax strongly arched, rather broad and stout, coarsely punctate. Wings small, rather transparent, oblong-ovate, broadly rounded at apex, about two and one-fourth times as long as broad; second marginal cell smaller than first; pterostigma nearly half as long as radial sector; apex of wing sometimes indistinctly fumate.

Genitalia.—*Male.*—Genital segment rather long, semiovate; forceps very long and very slender, roundly acute at tip. Anal valve

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[1] Pomona Journal of Entomology, vol. 3, 1911, p. 629.

not much longer than forceps, roundly tapering to tip, subacute at apex. *Female.*—Genital segment almost as long as rest of abdomen, broad at base, acuminate, very acute at apex; dorsal valve somewhat longer than ventral, equally acute.

Described from many males and females collected at Claremont, California, by D. L. Crawford, on *Ceanothus crassifolius;* found in very great numbers and in all stages of development in the middle of April; three from Los Angeles, California (Coquillett), April, on the same host plant; twenty-two from Santa Clara County, California (Koebele), May, on *Ceanothus rigidus;* eight from Eureka, California (H. S. Barber), May, on *Ceanothus*, and one from Scotia, California (Barber), May; several from Claremont, California, on *Rhamnus* sp.

Type in author's collection.

ARYTAINA ACULEATA, new species.

Similar to *amorphæ* and *ceanothæ* in size and general appearance, with whitish thoracic markings as in the former, and head as in the latter; differing from both in female genital segment, which is subglobose at base and produced caudad into a slender, black, styliform process not as long as the large basal portion. Wings as in *amorphæ*, but first marginal cell much shorter and pterostigma much smaller.

Described from three females from California, two of them from Santa Cruz Mountains (Koebele), and the other from Los Angeles (Coquillet), no data accompanying either, but the latter specimen was placed with several specimens of *ceanothæ* collected on *Ceanothus crassifolius*, April 1, in the same locality.

Type.—Cat. No. 18103, U. S. Nat. Mus.

ARYTAINA PUBESCENS, new species.

Figs. 52, 232, 287, 443.

Length of body 1.6 mm.; length of forewing 2; width of head 0.86. General color light brown, head greenish white, scutellum with several light-colored stripes. Body small.

Head small, deflexed, about as broad as thorax, punctate, conspicuously pubescent. Vertex rather flat, pubescent, arcuate on posterior margin, elevated on postocellar regions, roundly bulging in front on each side of median line. Genal cones short, broad, broadly rounded, somewhat pubescent. Antennæ short, moderately slender.

Thorax arched strongly, coarsely punctate and pubescent. Pronotum rather long, arched, with a prominent knob like lateral termination. Præscutum moderately flat. Wings small, subcoriaceous, whitish, maculate on apical third, and a macula at base of media; marginal cells subequal, moderately large; pterostigma not very large; about two and one-third times as long as broad, slightly rhomboidal in outline, broadly rounded at apex.

Genitalia.—*Male.*—Genital segment small, inconspicuous; forceps small, short, stout, with a black hook-like spine at tip; anal valve relatively not very long, curved, simple, sides subparallel. *Female.*—Genital segment short, retracted into abdomen beneath; dorsal valve longer than ventral, with a prominent convexity dorsad; ventral valve short, acute at tip, with a long projection laterad toward dorsal convexity.

Described from numerous males and females collected in Ormsby County, Nevada, by C. F. Baker, and four specimens from Colorado (Baker); fourteen from Placer County, California (Koebele), September, on *Purshia tridentata,* eleven from Nevada County, California (Koebele), September, on same host, and four from Siskiyou County, California (Koebele).

Type in author's collection.

Genus PSYLLOPSIS Loew.

Psyllopsis Loew '78:587.

Head deflexed rather strongly; vertex not sharply defined on anterior margin but merged into genæ; genal cones perpendicularly inclined, acutely conical, divergent, not continuing plane of vertex. Antennæ at least moderately long. Thorax well arched; pleural suture of prothorax as in *Arytaina,* but pronotum not knoblike at lateral termination. Wings ovate, subhyaline, usually with a pterostigma.

Type of genus.—*Psyllopsis fraxinicola* Förster.

SYNOPSIS OF SPECIES.

a^1. Antennæ about two and a half times as long as width of head; first marginal cell not twice as large as second; male anal valve very broad in lateral aspect. *fraxinicola* Förster.

a^2. Antennæ over four times as long as width of head; first marginal cell three times as large as second; male anal valve slender................*mexicana*, new species.

PSYLLOPSIS FRAXINICOLA Förster.

Figs. 21, 47, 230, 280, 439.

Psylla fraxinicola Förster '48:73.—Meyer-Dür '71:399.—Scott '76:544.—Loew '77:138.

Psyllopsis fraxinicola Loew '78:588; '88:14.—Reuter '81:153.—Scott '86:281.—Edwards '96:234.—Sulc '06:2.—Oshanin '07:348.—Felt '11:39.

Psylla viridula Förster '48:74.—Meyer-Dür '71:399.

Psylla fraxinola Meyer-Dür '71:398.

Psylla unicolor Flor '60:479; '61:340, 347 353.

Psylla chlorogenes Meyer-Dür '71:399.

Length of body, 2.5 mm.; length of forewing, 3.2; width of head, 0.90. General color, greenish-yellow throughout.

Head strongly deflexed, not quite as broad as thorax, punctate; vertex anteriorly roundly sloping down toward genal cones, without sharp marginal line in front differentiating it from genæ. Genal cones moderately long, conical, divergent, rather acute at apex, slightly pubescent, deflexed from plane of vertex and descending almost vertically. Antennæ slender, about two and a half times as long as width of head.

Thorax strongly arched, coarsely punctate; pronotum long, ascending toward præscutum; latter rather long. Wings moderately large, oblong-ovate, hyaline, slightly flavous, a little more than twice as long as broad, broadly rounded at apex; pterostigma long, closed, yellow; radial margin with setæ.

Genitalia.—*Male.*—Genital segment large; forceps relatively short, shaped like an ax blade, narrow at base, very broad at apex and convexly rounded, with a large thick process on inner posterior margin near base projecting inward to meet the process of the other side; anal valve large, long, greatly broadened basally, profile triangular. *Female.*—Genital segment short, stout, not very acute at apex, valves subequal in length.

Described from one pair from England (James Edwards), four specimens from Scotland (O. M. Reuter); eight from Washington, District of Columbia (Hubbard and Schwarz), June; and about sixty from Stanford University (H. Morrison), on leaves of *Fraxinus* sp., in May. One female belonging to this species, or very closely related, was taken on walnut leaves (*Juglans regia*) at Richfield Springs, New York, in August, 1897; reported by E. P. Felt ('10: 39) as injuring leaves of *Fraxinus* at Rochester, New York. The species probably has a wider distribution than these records show.

PSYLLOPSIS MEXICANA, new species.

Figs. 46, 228, 436.

Length of body 2.2 mm.; length of forewing 3.1; width of head 0.92. General color brownish yellow throughout. Body of medium size.

Head about as broad as thorax, coarsely punctate, strongly descending; vertex with a sulcate fovea on each side of median line extending obliquely toward median line, anterior margin not sharply defined, rounded downward toward genal cones. Genal cones almost as long as vertex, projecting down almost vertically, scarcely divergent, subacute at apex, pubescent. Clypeus large. Antennæ very long and slender, fully as long as body or over four times as long as width of head.

Thorax strongly arched, broad, coarsely punctate. Pronotum long, ascending, distinctly broadened at median dorsal portion, with lateral extremities rather narrow. Hind tibiæ with a small spur at base. Wings elongate, almost three times as long as broad, sides subparallel, rounded at apex, hyaline, slightly browned, transparent; first marginal cell much larger than second; pterostigma long and narrow; veins dark brown.

Genitalia.—*Male.*—Genital segment small, rounded; forceps long, arched, acuminate, acute at apex; anal valve long, slightly broadened at middle, converging toward tip. Described from one male from Acapulco, Mexico (C. F. Baker).

Type in author's collection.

Tribe PSYLLINI.

MITRAPSYLLA, new genus.

Body moderately large, not strongly arched on dorsal surface, usually more or less variegated in color. Head not strongly deflexed; vertex rather large, with a prominent ridge along each side of median line and a furrow between and outside of these ridges, converging to a rather acutely angled apex in front; genal cones very short, porrect, divergent. Eyes somewhat recessive. Antennæ long and slender. Thorax rather broad. Hind tibiæ with a small tooth at base. Wings subhyaline, broadly ovate, with a pterostigma.

Type of genus.—*Mitrapsylla albalineata*, new species.

MITRAPSYLLA ALBALINEATA, new species.

Figs. 78, 79, 249, 300, 465.

Length of body 2.4 mm.; length of forewing 2.8; width of head 0.91. General color light to dark brown ground color, with white markings and stripes; vertex with a white stripe on each side near median line and a white spot below each posterior ocellus; pronotum with two white stripes continuing those on vertex; præscutum with a white stripe on median line and one on each lateral margin; scutum with a median stripe and one on each side; pleuræ with several conspicuous white spots.

Head scarcely deflexed, moderately large, fully as broad as thorax, finely punctate; vertex broad posteriorly, converging evenly toward front, the whole more or less triangular in outline, with a conspicuous ridge on each side of median line (white), and a furrow between these and on the outside of each, produced in front into a rather acute point on each side of median line. Genal cones short, relatively thick, depressed a little below level of vertex, divergent, acute at apex, very sparsely pubescent. Antennæ long, over three times as long as width of head, slender, apical portion of each segment dark.

Thorax not strongly arched, coarsely punctate; præscutum moderately large. Hind tibiæ with a small spur at base. Wings rather small, subhyaline, more or less transparent, slightly browned or fumate along veins or sometimes the whole surface slightly fumate, a little more than twice as long as broad, broadly rounded at apex; pterostigma small, distinct.

Genitalia.—*Male.*—Genital segment relatively large; forceps long, thick, simple; anal valve long, broadest at base, slightly constricted midway. *Female.*—Genital segment fully as long as rest of abdomen, deflexed, acuminate; dorsal valve longer than ventral; pubescence very sparse.

Described from many males and females collected at Chinandega, Nicaragua, by C. F. Baker, San Marcos, Nicaragua (Baker), Acajutla, Salvador (Baker), Acapulco, Mexico (Baker), and Oaxaca, Mexico (Crawford). No biological data with these.

Type in author's collection.

The white markings are very conspicuous and constant in extent and color. A few specimens present variations in color not worthy of varietal names but deserving of mention. Two males, one from Chinandega and the other from Granada, Nicaragua, have the thoracic stripes a very dirty yellowish white and the cephalic stripes almost wanting entirely. The four specimens from Oaxaca, Mexico, are uniformly darker in color, almost black, the wings deep yellow; in two of them the stripes are almost wanting on the vertex and yellowish on the thorax, while in the other two the stripes are white and conspicuous and the eyes are whitish. The species seems to be distributed very widely throughout the American tropics and more extensive collections will probably complete the variation series in color. The size and structure is quite constant throughout the one hundred or more specimens before me.

MITRAPSYLLA CUBANA, new species.

Length of body, 2.1 mm.; length of forewing, 2.5. General color light brown; præscutum and scutum with light yellowish stripes placed as in the preceding species.

This species resembles quite closely the related species *albalineata* in many respects, differing in the following characters: Body smaller than in related species. Vertex with a deep sulcate depression posteriorly between ocelli and median line, with the ridges along the median line very prominent but not striped with white. Genal cones similar. Pronotum without stripes, unicolored; pleurites of prothorax longer and narrower. Wings small, hyaline, transparent, not in the least fumate or yellow; venation more or less similar. Genitalia similar except that the female genital segment is narrower and more acuminate and not deflexed.

Described from one female from Havana, Cuba (C. F. Baker).

Type in author's collection.

Genus PSYLLA Geoffroy.

Psylla GEOFFROY 1762:482.—SCOTT '76:530.—LOEW '78:600.—FROGGATT '01:243.

Dorsum arched, usually strongly so; head broad, nearly as broad as or broader than thorax, more or less deflexed; vertex usually elevated at posterior ocelli. Genal cones always present, variable in shape, more or less coniform and divergent, usually deflexed and depressed from plane of vertex. Eyes large, hemispherical; front between and in front of lobes of vertex, with the frons not at all, or sometimes very slightly, visible around the ocellus. Antennæ slender, at least as long as width of head, usually much longer, typically ten-segmented. Thorax broad; pronotum relatively longer than in *Trioza*, ascending; pleural suture of prothorax oblique, not extending to middle of lateral extremity of pronotum, but to its posterior edge or often not attaining to it at all. Præscutum long. Legs usually long and strong; hind tibiæ often with a distinct spur or tooth at base behind and with five or six black spines at apex; basal tarsus of hind legs with two black, claw-like spines at apex, lying one on each side of second tarsus. Forewings hyaline, transparent, rounded at apex, never angulate; cubitus and media always with a distinct petiole, which is usually distinctly shorter than the basal portion of radius (discoidal subcosta); pterostigma nearly always present; veins set with more or less visible setæ, usually bi-seriately.

Type of genus.—*Psylla alni* Linnæus (*Chermes*).

The first use of the name *Psylla* was by Geoffroy[1] in 1762. He described the genus *Psylla* but named no species within it, merely indicating nine species by a brief Latin diagnosis. His nomenclature, therefore, was binary but not binomial. This is a case exactly parallel with that of Gronow's which is treated at length by the International Committee on Nomenclature, and, since the generic names used in the latter case are considered valid, there is no reason why Geoffroy's *Psylla* should not, also, be valid.

No species was indicated by Geoffroy as the type-species, but in 1810 Latreille (**1810**: 264) described the genus again and made *Chermes alni* Linnæus the type-species.

Lamarck (**1801**: 298) redescribed the genus in 1801 and named under it the single species *Ch. ficus* Linnæus, but there is no evidence whatever to show that he designated this as the type-species. In some genera he named two or several species and before each, in every case, he placed a star. He offers no explanation of the significance of the star. Kirkaldy in **1904** ('**04**: 254) made *Psylla* a synonym of *Chermes* because, he stated, Lamarck had fixed the type of the latter as *Chermes ficus* Linnæus, which is a Psyllid and not an Aphid. As a matter of fact, Lamarck does not describe *Chermes* at all, but, as pointed out above, mentions *ficus* under *Psylla*. Kirkaldy's contention, therefore, is groundless.

It is true that the original description of *Chermes* by Linnæus fits more decidedly the Psyllid group than it does Aphids or Coccids. He included within it, however, species which have been subsequently placed in each of these families. Geoffroy's *Psylla* was not, apparently, intended for a substitute for *Chermes*, as Kirkaldy contended, but only to take in part of it. Since a type-species has been designated for *Psylla* since 1810 and since Passerini in 1865 designated an Aphid species as the type of *Chermes*,[1] it is impossible to consider *Psylla* as a synonym of the latter.

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[1] Histoire Abrégée des Insectes, vol. 1, 1762, p. 482.

The genus has been redefined several times (see bibliography above), and various species have been designated as type. The valid type, however, is *alni* Linnæus, as set by Latreille.

Foerster ('48: 67) has divided the original genus into many distinct genera, most of which are still valid. Franz Loew ('78: 600) defined *Psylla* as it is to-day regarded. It is a very large genus and its members are subject to considerable variation, thereby rendering it difficult to determine specific lines in many cases.

SYNOPSIS OF SPECIES.

a^1. Antennæ not over two and a half times as long as width of head (except sometimes in *brevistigmata*); length to tip of folded wings distinctly less than 5 mm.

- b^1. Antennæ less than twice width of head, or at most not more than twice.
  - c^1. Hind tibiæ without spur at base,[2] or if present very small and indistinct.
    - d^1. Forceps of male not simple; wings clear, transparent.
      - e^1. Male forceps very broad at base, abruptly constricted near base, thence slender; anal valve long, sides subparallel; vertex only slightly emarginate in front at median line.................... *fibulata*, new species.
      - e^2. Male forceps with posterior margin conspicuously sinuate, apical third slender, acute; anal valve converging to tip; vertex more deeply emarginate in front............................... *sinuata*, new species.
      - e^3. Male forceps converging to near apex, then abruptly broadened and T-shaped; antennæ less than one and a half times width of head. *parallela*, new species.
    - d^2. Forceps of male simple, sides subparallel or converging to apex; wings usually more or less fumate or maculate, sometimes clear.
      - e^1. Wings maculate on posterior and apical margins and along Cu to its furcation; pterostigma short; female genital segment exceedingly short. *maculata*, new species.
      - e^2. Wings not maculate but more or less fumate, or clear; pterostigma rather long; female genital segment not exceedingly short.
        - f^1. Antennæ scarcely longer than width of head........... *breviata* Patch.
        - f^2. Antennæ about one and a half to two times as long as width of head.
          - g^1. Body very small, less than 3 mm. to tip of folded wings; wings small.
            - h^1. Wings fumate in apical half, without spot at tip of clavus; genal cones separate at base and strongly divergent.
              - i^1. Forceps of male 0.30 mm. long or more, converging to a simple, acute tip, pubescent almost uniformly from base to tip; body dark.................................... *minuta*, new species.
              - i^2. Forceps of male 0.20 mm. or less, apex not simply pointed; scarcely pubescent on distal half; body lighter in color. *coryli* Patch.

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[1] I do not know whether or not this was the earliest date at which the type of *Chermes* was set, but it certainly was not set before 1810.

[2] If the hind leg is cleared and mounted on a glass slide, and examined under high magnification, a spur will be found on practically every species of the genus. The above key refers, however, to a lower magnification and the specimen not mounted on a slide.

h^2. Wings clear; genal cones not separate at base and not strongly divergent.

i^1. Color of body whitish; wings without black spot at tip of clavus. *alba*, new species.

i^2. Color of body flavous to reddish brown, with dark markings on thoracic dorsum; wings with a prominent black spot at tip of clavus........................*pyricola* Förster (summer form).

g^2. Body larger, more than 3 mm. long to tip of folded wings, usually more nearly 4 mm.

h^1. Female genital segment short, less than half as long as rest of abdomen; antennæ nearly twice as long as width of head; wings fumate........................*pyricola* Förster (winter form).

h^2. Female genital segment as long as rest of abdomen, or nearly so.

i^1. Antennæ nearly twice as long as width of head; dorsal valve of female genital segment downcurved; wings yellow. *hartigii* Flor.

i^2. Antennæ variable from one and one-fourth to one and three-fourths as long as width of head; dorsal valve of female genital segment not downcurved; wings variable in color.

j^1. Wings with a black spot at tip of clavus...*quadrilineata* Fitch.

j^2. Wings without black spot at tip of clavus.

k^1. Body reddish brown to blackish; wing veins black.

l^1. Genal cones reddish or orange at tips; male anal valve not much longer than forceps; forceps converging to apex.

m^1. Male forceps large, .45 to .50 mm long; female genital segment very slender........*americana*, new species.

m^2. Male forceps smaller, .25 to .30 mm long, more densely pubescent; female genital segment stouter at base. *americana minor*, new variety.

l^2. Genal cones unicolorous to tip; male anal valve more than twice as long as forceps; forceps broad, flexed, apex broadly truncate..........................*ribis* Patch.

k^2. Body light flavous to orange; wing veins flavous; genal cones not darker at tip; male forceps about as long as in *americana minor*......................*americana flava*, new variety.

c^2. Hind tibiæ with a distinct spur at base behind; pterostigma long.

d^1. Female genital segment not as long as rest of abdomen, not very large; genal cones not quite as long as vertex; antennæ scarcely one and a half times as long as width of head..........................*alaskensis* Ashmead.

d^2. Female genital segment elongate, longer than rest of abdomen, or at least as long; antennæ nearly twice as long as width of head.

e^1. Genal cones longer than vertex; female genital segment unusually large and thick...............................*magnicauda*, new species.

e^2. Genal cones not as long as vertex; female genital segment not unusually large, more elongate and acute at end..................*striata* Patch.

b^2. Antennæ more than twice as long as width of head; body usually larger than in preceding species.

c^1. Female genital segment longer than rest of abdomen; pterostigma usually small.

d^1. Genal cones acute or subacute at apex as long as vertex or longer; Cu_1 not strongly arched................................*carpinicola*, new name.

d^2. Genal cones broadly rounded at apex, only a little divergent, about as long as vertex; Cu_1 more strongly arched..............*cephalica*, new species.

c^2. Female genital segment shorter than rest of abdomen.

d^1. Pterostigma of forewing long; head very broad, with a short, constricted, stalk-like area between inner margin of eye and elevated portion of vertex and posterior ocellus; genal cones not separated at base; color greenish yellow.

e^1. Antennæ conspicuously annulated with black on basal half. *annulata* Fitch.

e^2. Antennæ uniformly yellowish, except terminal segment black. *negundinis* Mally.

d^2. Pterostigma of forewing very short, broad at base; eyes not stalked, vertex extending uniformly to base of eyes; genal cones separated at base, strongly divergent; color orange to red, vertex often bordered with white, and genal cones white or pale on basal half.

e^1. Male forceps converging to a simple point, not acuminate. *brevistigmata* Patch.

e^2. Male forceps more slender, more acuminate, and turned forward in apical third, bluntly pointed................*brevistigmata acuta*, new variety.

a^2. Antennæ distinctly over two and a half times as long as width of head, sometimes much more.

b^1. Body very large, length to tip of folded wings at least 5 mm., seldom less; antennæ nearly or more than three times as long as width of head.

c^1. Pterostigma almost obsolete; basal spur on hind tibiæ small.

d^1. Female genital segment longer than rest of abdomen, very slender and acuminate, abruptly enlarged at base; male forceps subacute at tip, not notched...*floccosa* Patch.

d^2. Female genital segment shorter than rest of abdomen, thick and stout; male forceps more or less notched at apex, or bifid.

e^1. Color of body nearly uniformly greenish yellow, or with an orange tinge; genal cones subacute...........................*astigmata*, new species.

e^2. Color similar but with three large conspicuous red spots on thoracic dorsum; genal cones acutely pointed.....................*trimaculata* Crawford.

e^3. Color of head and thoracic dorsum rosy, abdomen vermillion with a black spot at base dorsad, and five transverse black bands. *cerasi* Patch.

c^2. Pterostigma distinctly present, usually rather large and long; basal spur on hind tibiæ larger.

d^1. Genal cones not as long as their basal width, very broadly rounded, about as long as vertex or shorter; forceps of male broadened apically; female genital segment as long as or often longer than rest of abdomen. *alni americana*, new variety.

d^2. Genal cones distinctly longer than their basal width, more or less acute at apex.

e^1. Female genital segment nearly as long as rest of body, acuminate, strongly upcurved, with an apparent suture about midway across both valves; color of body dark brown, notum striped..........*caudata*, new species.

e^2. Female genital segment only about three-fifths as long as rest of body, not upcurved, without the apparent suture; color of body typically green. *galeaformis* Patch.

b^2. Body small, scarcely over 3 mm. long to tip of folded wings; antennæ extremely long and slender, more than four times as long as width of head; basal spur on hind tibiæ large; male forceps not simple.

c^1. Genal cones moderately long, coniform, not quite as long as vertex.

d^1. Wings less than twice as long as broad, rather square on apical margin; pterostigma short.................................*torrida*, new species.

*d*². Wings larger, more than twice as long as broad, broadly rounded at apex; pterostigma half as long as Rs..................*orizabensis*, new species.

*e*². Genal cones very short, rounded at tips; wings twice as long as broad. *minuticona*, new species.

PSYLLA FIBULATA, new species.

Figs. 98, 266, 314, 482.

Length of body 1.6 to 1.9 mm.; length of forewing 2.6; width of head 0.81. General color light yellowish green throughout; antennæ black distally.

Vertex scarcely half as long as broad, bulging forward in front on each side of median line, with a shallow fovea on each side posteriorly; genal cones about as long as vertex, not strongly divergent, subacute, pubescent. Antennæ about one and a half times as long as width of head.

Thorax strongly arched. Legs rather stout; hind tibiæ about as long as femora, without a spur at base, or if present it is very small. Wings hyaline, slightly whitish in color, about two and a half times as long as broad, venation as in illustration; pterostigma long and rather narrow.

Genitalia.—Male.—Anal valve long, much longer than forceps, sides subparallel, pubescence short; forceps enlarged at base, acute at apex, front margin nearly straight, posterior margin deeply concave making basal portion unusually large and distal half slender, acuminate, slightly pubescent. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve distinctly longer than ventral, slender at apex.

Described from several males and females from Colorado (no data) collection of C. F. Baker.

Type.—Cat. No. 18104, U. S. Nat. Mus.

PSYLLA SINUATA, new species.

Figs. 267, 268, 491.

Length of body 1.9 to 2.1 mm.; length of forewing 3.1; width of head 0.89. General color greenish yellow, antennæ black on distal half or third.

Similar to *fibulata*, but differing as follows: Body and wings larger; vertex relatively a little longer; genal cones longer. Hind tibiæ with a minute spur at base, scarcely visible. Male forceps longer, with posterior margin sinuate conspicuously, with long pubescence, apical portions slender and strongly bowed inward. Female genital segment similar but larger and thicker.

Described from several males and females from Pagosa Springs, Colorado (C. F. Baker); these bear the manuscript name of *Psylla fibulata simulans* Crawford; several from Ungava Bay, Labrador (L. M. Turner), July 22, seem undoubtedly to belong to this same species.

Type.—Cat. No. 18105, U. S. Nat. Mus.

PSYLLA PARALLELA, new species.

Closely related to *fibulata*, differing as follows: Vertex more emarginate in front at median line; genal cones not quite as long as vertex; antennæ only about one and a fourth times as long as width of head. Hind tibiæ with basal spur very small or wanting. Wings clear, similar in shape and venation to preceding species; pterostigma long, yellow-opaque. Male forceps a little shorter than anal valve, middle somewhat enlarged, then converging to near apex where an abrupt broadening produces a T-shaped apex. Female genital segment as long as rest of abdomen, slender, dorsal valve longer than ventral.

Described from four males and one female from Nevada County, California (Koebele), September.

Type.—Cat. No. 18106, U. S. Nat. Mus.

PSYLLA MACULATA, new species.

Figs. 100, 315, 485.

Length of body 1.5 mm.; length of forewing 2.2; width of head 0.85. General color dark brown; vertex, posterior half of pronotum; praescutum caudad, scutum dorsad, lighter brown to yellowish; facial cones tipped with brown. Body small.

Similar to *P. americana*, but vertex slightly pubescent, bulging forward in front a little more; genal cones about as long as vertex, separate at base, not deflexed much from plane of vertex. Antennæ not quite twice as long as width of head. Basal spur of hind tibiæ very minute. Wings maculate on posterior apical margin and along cubitus. Female genital segment very short and small; dorsal valve scarcely longer than ventral.

Described from one female from Colorado (C. F. Baker).

Type.—Cat. No. 18107, U. S. Nat. Mus.

PSYLLA BREVIATA Patch.

Fig. 133.

Psylla breviata PATCH **12b**: 220.

Length of body 2.5 mm.; length of forewing 2.9; width of head 0.89. General color greenish yellow; antennæ black at tip.

Vertex a trifle more than half as long as broad, with a shallow depression on each side discally; genal cones about two-thirds as long as vertex, divergent, subacute at apex, slightly pubescent. Antennæ short, only a little longer than width of head. Thorax as in preceding species. Legs slender; hind tibiæ with a very small spur at base (easily visible in a balsam mount). Wings typical in shape and venation, slightly yellowish in apical half; pterostigma long.

Genitalia.—*Male.*—Anal valve longer than forceps, of usual form, elongate with sides subparallel, pubescent; forceps rather slender and long, sides straight and nearly parallel to near apex, then the anterior margin is conspicuously emarginate, making a terminal tooth-like process (fig. 133). *Female.*—Genital segment about as long as rest of abdomen, stout; dorsal valve longer than ventral, slender distad, pubescent.

Described from one female (paratype), mounted in balsam, from Dow's Swamp, Ottawa, Ontario, Canada (W. Metcalfe), June 14, 1903 (this specimen, together with paratypes of several other species, was loaned to me by Miss E. M. Patch; her description of this species was based on three females only); several males and females from Marquette, Michigan (Hubbard and Schwarz), July 27; Placer County and Nevada County, California (A. Koebele), September; Argus Mountains, California (Koebele), on *Pinus monophylla*, May, 1891. It is possible that the latter do not belong to this species.

PSYLLA MINUTA, new species.

Figs. 99, 261, 316, 483.

Length of body (male) 1.4 mm.; (female) 1.8; length of forewing 1.8; width of head 0.75. General color brown to dark brown or black; thoracic dorsum and vertex light brown to brown, sometimes dark; scutum with stripes of a lighter color; antennæ mostly dark; femora and tibiæ usually mostly brown or darker. Body small.

Vertex a little more than half as long as broad, bulging forward narrowly on each side of front ocellus, somewhat pubescent, with a round fovea on each side discally; genal cones slender, strongly divergent, separated at base, acute at apex, not quite as long as vertex, with several long setæ distad; antennæ one and a half to one and three-fourths times as long as width of head, slender.

Thorax very strongly arched, with very sparse pubescence. Legs slender; hind tibiæ with basal spur very small or wanting. Wings small, venation typical, conspicuously fumate in apical half, sometimes darkly so; pterostigma long, rather large.

Genitalia.—*Male.*—Anal valve a little longer than forceps, broad (in caudal view), apex rounded, pubescent; forceps about 0.30 mm. long or more, converging to a simple black point at apex, entire surface rather densely covered with large, heavy spine-like setæ. *Female.*—Genital segment as long as rest of abdomen or longer, acutely pointed, broad at base, dorsal valve longer than ventral.

Described from numerous males and females from American Fork Cañon, Utah (Hubbard and Schwarz), on *Purshia tridentata*, June 13; Williams, Arizona (Barber and Schwarz), on *Purshia tridentata*, May 25–28; Argus Mountains, California (Koebele), May, 1891; Ormsby County, Nevada (Baker); a number more from Colorado, with no data. Some of these specimens bear the manuscript name of *Psylla purshiæ* Riley, and *Brachypsylla purshiæ*.

Type.—Cat. No. 18108, U. S. Nat. Mus.

PSYLLA CORYLI Patch.

Very similar to *minuta* in most respects, including size and general proportions; color lighter. Vertex less pubescent, similar in form. Male anal valve similar; forceps distinctly shorter, not over 0.20 mm. in length, with similar spine-like setæ on inner surface, but only on basal half; apex with a conspicuous notch on outside near tip, giving he appearance of an inner apical tooth. Female not known to me.

Described from one male (paratype) from Colorado (no data), kindly loaned to me by Miss Patch. This species is exceedingly close to *minuta*, and were it not for the constant difference in the male genitalia I would not hesitate to include them both in one species.

It should be noted that the manuscript name of *Psylla coryli* Riley has been attached to another species, represented in the National Museum collection, which is close to *carpinicola* (Fitch's *carpini*). Miss Patch states that the present species also was known by the same manuscript name.

PSYLLA ALBA, new species.

Figs. 254, 321, 490.

Length of body (male) 1.6 mm; (female) 1.9; length of forewing 2 to 2.2; width of head 0.69. General color greenish white; antennæ black at tip.

Vertex about half as long as broad, with two foveæ as usual, bulging in front rather roundly; genal cones nearly or fully as long as vertex, not strongly divergent, subacute, pubescent. Antennæ about one and three-fourths times as long as width of head.

Thorax not strongly arched. Legs small, short; hind tibiæ about as long as femora, with basal spur very small or wanting. Wings whitish, clear, typical in shape and venation; pterostigma moderately large.

Genitalia.—*Male.*—Anal valve longer than usual, of usual elongate form, pubescent; forceps small, simple, rather strongly bowed, slender, acutely pointed at tips. *Female.*—Genital segment about as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from many specimens of both sexes from Ormsby County, Nevada (C. F. Baker); Claremont, California (Baker); Sacramento, California, on *Salix longifolia,* July; Folsom, California (Koebele), on same host plant; Las Vegas, New Mexico (Barber and Schwarz), August 8; El Paso, Texas (Cockerell), May 13. Some of these bear the manuscript name of *Psylla americana alba* Crawford.

Type in author's collection.

PSYLLA PYRICOLA Förster.

Figs. 8, 13, 14.

Psylla pyricola Förster **'48**:77.—Scott **'76**:137; **'83**:205.—Loew **'82**:247; **'84**:148; **'86**:156; **'88**:15.—Sajo **'95**:28.—Edwards **'96**:240.—Sulc **'05**:2; **'10**:34.—Kuwayama **'08**:163 (Japan).—Riley **'84**:69; **'91**:127 (abstract of Loew **'86**:156).—Riley and Howard **'93**:226.—Slingerland **'92**:159–186; **'96**:69–86.—Lintner **'93**:317.—Mally **'94**:153 (mention).—Marlatt **'95a**: 175–185; **'95b**:(Circular 7).—Smith **'96**:137; **'09**:109 (mention).—Patch **'11a**:11; **'12b**:221.
Psylla apiophila Förster **'48**:78.—Loew **'77**:137; **'82**:232.
Psylla notata Flor **'61**:365.—Loew **'82**:244.
Psylla pyrisuga Barnard, Proc. Amer. Ass. Adv. Sci., vol. 28, 1879, p. 478.
Psylla pyri Curtis, Gard. Chron. **1842**:156.—Harris, Inj. Insects, **1852**:201; (for several more brief articles see Slingerland **'92**:186.)
Psylla simulans Slingerland **'92**:186.
(?) *Psylla argyrostigma* Förster **'48**:97.

Summer form.—Length of body (male) 1.5 mm; (female), 1.9; length of forewing 1.7 to 1.9; length to tip of folded wings 2.1 to 2.8; width of head 0.78. General color light orange to reddish brown, with darker markings; vertex, genal cones, scutum between stripes, male genitalia, legs except hind femora, antennæ except at tip, light brown to orange; genal cones lighter colored at apex than at base.

Head very strongly deflexed; vertex about half as long as broad, with two foveæ, conspicuously emarginate in front at median line with front ocellus in emargination; genal cones about two-thirds as long as vertex, not strongly divergent, subacute at tips, pubescent. Antennæ about one and a half times as long as width of head, slender.

Thorax strongly arched. Legs slender; hind tibiæ with basal spur very small, or wanting. Wings transparent, clear or often with a slight yellowish tinge, especially in the distal cells; with a conspicuous black spot at tip of clavus; pterostigma long and relatively broad; venation typical.

Genitalia.—*Male.*—Anal valve a little longer than forceps, sides subparallel, pubescent; forceps simple, rather acute at tips, tapering uniformly from base to tip, about as long as in *coryli* Patch. *Female.*—Genital segment short, scarcely longer than two preceding segments, dorsal valve a little longer than ventral, both acute.

Winter form.—Differs from summer form chiefly in being larger and darker in color. Length to tip of folded wings 3.3 to 4 mm.; other measurements proportionate; nearly one-third longer. General color very dark reddish brown to black; markings black; areas noted in summer form as lighter are correspondingly a little lighter here, but antennæ mostly dark from base to tip; wings darker on basal portion, apically clear, veins black and very conspicuous, black claval spot more pronounced.

Described from numerous males and females from Ithaca, New York, and several other near-by localities; collected from May to August of several years; and many from Detroit, Michigan (Hubbard and Schwarz), October 7.

Distribution.—Introduced from Europe into Salisbury, Connecticut (1832); spread subsequently into Massachusetts and New York; recorded later from Illinois (Le Baron), Michigan (Schwarz), (see Slingerland **'92**:162); Ohio (Webster); New Jersey (Smith), (see Lintner **'93**:325); Maine (Patch **'11**:11); "southwest to Maryland and Virginia" (Sanderson—Insect Pests of Farm, Garden, and Orchard **1912**:641); California (Essig. Mon. Bul. Cal. Comm. Hort. **2**:43; 1913), the latter is doubtful.

Distribution outside of America: Great Britain, Gallia, Germany, Austria, Hungary, Transcaucasia, Akstafa (Oshanin **'07**:352); Japan (Kuwayana **'08**:163).

Food plant.—*Pyrus communis* (common pear), on which it is very destructive and of great economic importance; reported on *Pyrus malus* (apple) to a less extent in Europe, but not in America.

Life history.—*Eggs.*—The eggs are deposited about the middle of April by the females which have passed the winter in hibernation; they are light yellowish in color, ellipsoidal, with a short attachment pedicel at large end and a slender filament at small, free end; deposited singly or in rows of five to ten in cracks and creases in the bark, or in old leaf scars at the bases of the terminal buds of the preceding year's growth.

The eggs hatch in from eleven to thirty days, according to the temperature. The hibernating adults disappear about the time most of the eggs have hatched.

Nymph.—First instar.—Oval, pale, translucent yellow, abdomen darker, eyes reddish; abdomen fringed with several long hairs; wing pads not distinguishable; antennæ three-jointed; length about 0.37 mm.

Second instar.—First molt about six or seven days after hatching; size one-third larger; color practically unchanged; antennæ four-jointed; wing pads begin to appear. Second molt in four days.

Third instar.—Length 0.77 mm. Wing pads blackish and thoracic markings begin to appear; antennæ six or seven jointed. Third molt three days later.

Fourth instar.—Full-grown nymph; length 1.4 mm.; width 1.15; oval, flattened; general color light yellowish brown, marked with blackish; wing pads, distal half of abdomen, head except a mesal light stripe, several bands and spots on thoracic and basal abdominal dorsum blackish or brown; a number of long, stout, spine-like setæ project from margin of body.

After five or six days more the adult emerges, making the cycle from egg to adult about one month. There are about four broods each year (in New York), but they are not sharply separated. All stages may be found on one tree from June to September. In general, however, the greatest numbers are present at intervals of about one month. The adults emerging in September are usually the hibernating winter forms. For further details on the life history and other phases of this species, consult Slingerland '92: or '96, from which source most of the above statements have been derived.

PSYLLA HARTIGII Flor.

Figs. 130, 145.

Psylla hartigii Flor '61: 469.—Loew '77: 130; '79: 577; '82: 240; '88: 18.—Reuter '81: 150.—Scott '82: 253.—Edwards '96: 244.—Sulc '08: 3; '10b: 24; '10c: 26 (pl. xii).—Oshanin '07: 358.
Psylla hartigii (?) Patch '12b: 222.
Psylla sylvicola Lethierry '74: 90.—Scott '76: 539.—Douglas '76: 68.—Edwards '96: 244.

Length of body (male) 2 to 2.5 mm; (female) 2.8 to 3.2; length of forewing 3.3; width of head 0.89. General color greenish yellow to orange yellow; antennæ black distally.

Vertex rather long down the center, fully half as long as broad, emarginate in front at median line, with two foveæ discally as usual; genal cones nearly as long as vertex, rather stout, roundly acute at apex, pubescent; antennæ one and three-fifths to two times as long as width of head.

Thorax arched, typical in form. Legs rather slender; hind tibiæ with basal spur wholly wanting. Wings slightly tinged with yellow, especially in apical half, venation typical; pterostigma large.

Genitalia.—Male.—Anal valve long, sides subparallel, truncate at apex, pubescent; forceps much shorter than anal valve, rather slender, somewhat constricted a little beyond midpoint, terminating in a blunt, slightly bifid apex, pubescent. *Female.*—Genital segment very elongate and slender, longer than rest of abdomen, dorsal valve a little longer than ventral and conspicuously curved downward.

Described from six males and females in balsam (some of the specimens used by Miss Patch in her description '12b: 222), from Orono, Maine, on birch (*Betula populifolia*); these were loaned by Miss Patch. Also, several females from" Liue," Europe determined by Sulc as *P. hartigii.*

The distribution in Europe is as follows: Great Britain, Germany, Austria, Finland, Russia (Oshanin '07: 358). Sulc reports its host plant in Europe to be *Betula alba.*

PSYLLA AMERICANA, new species.

Figs. 101, 266, 318, 486, 487, 488.

Psylla americana Crawford '11: 628 (n. n).

Length of body 2 to 2.4 mm.; wing length 3 to 3.3; width of head 0.95 to 1.04. General color reddish brown to dark brown or blackish; vertex reddish, sometimes whitish in center; genal cones reddish at apex, paler than vertex; pronotum usually black cephalad, pale on posterior margin; præscutum whitish on posterior margin; scutum often striped with black; abdomen dark; antennæ mostly dark; wings clear, veins dark.

Vertex broad, about half as long as broad, long down median line, lobes becoming narrow on each side of front ocellus, with two foveal impressions; genal cones seldom as long as vertex, divergent, rather acutely pointed, with short pubescence. Antennæ usually about one and a half times as long as width of head, sometimes a little longer, rarely shorter.

Thorax arched rather strongly, typical in form. Legs moderately stout; hind tibiæ slightly longer than femora, with basal spur very small or wanting. Wings long, clear, transparent, rarely with a yellowish tinge, veins black and conspicuous, venation typical; pterostigma large, denser than adjacent membrane.

Genitalia.— *Male.*—Anal valve longer than forceps, of usual form, pubescent; forceps rather long and large, usually about 0.45 to 0.50 mm. long, sometimes less, broadest at base and rapidly converging to a narrow and acute apex. *Female.*—Genital segment slender, as long as rest of abdomen or longer, dorsal valve very slender in apical third and longer than ventral valve.

Described from numerous specimens of both sexes from: California: Claremont (Crawford), on *Pinus ponderosa*, June, 1911 (altitude 10,000 feet); Argus Mountains (Koebele), on *Pinus monophylla*, May, 1891; Placer and Nevada Counties (Koebele), September; Banff Springs, Alberta, Canada (Hubbard and Schwarz), June.

Type in author's collection.

PSYLLA AMERICANA MINOR, new variety.

Very similar to species in size, coloration, and general structural characters, differing as follows: Male forceps shorter and more pubescent, seldom more than 0.30 mm. long, usually about 0.20 to 0.25 mm.; anal valve proportionately shorter and broader. Female genital segment similar but usually thicker dorso-ventrally.

Described from many males and females from Colorado (C. P. Gillette), on *Salix* sp.; Boulder, Colorado (Rohwer); Berkeley, California (Crawford), on *Salix lasiolepsis*, January, 1912; Laguna Beach, California (Crawford), on same host, July, 1911; Los Angeles, California

(Koebele), on *Salix californica*, April; Fieldbrook, California (Barber), May 31, 1903. Some of these specimens bear the manuscript name of *Psylla rufula* Riley.

Type.—Cat. No. 18109 U. S. Nat. Mus

PSYLLA AMERICANA FLAVA, new variety.

Very close to the species and similar in general structural characters, but differing in color chiefly; color conspicuously lighter; dorsum with indistinct stripes or none at all; genal cones uniform in color; wings whitish, veins yellowish instead of black. The genitalia of the male resemble those of the variety *minor* of the species; the female genital segment is variable from slender to rather thick.

Described from numerous males and females from Utah: Park City, Alta and Utah Lake, collected by Hubbard and Schwarz, in June; Victoria, Vancouver, British Columbia (Hubbard and Schwarz), June; Oregon (Koebele); Santa Clara County, California (Baker); Los Angeles, California (Coquillett); Pagosa Springs, Colorado (Baker). Some of these bear the manuscript name of *Psylla americana longipennis* Crawford.

Type.—Cat. No. 18110, U. S. Nat. Mus.

PSYLLA RIBIS Patch.

Psylla ribis PATCH '12b: 222.

Similar in size and general appearance to *americana*, and especially the variety *minor;* differing as follows: Genal cones less acute, not tipped with a darker shade than that of base; antennæ shorter than average of *americana;* wings similar; pterostigma large, yellow. Male anal valve very elongate, more than twice as long as forceps, converging a little toward apex, straight; forceps rather broad and thick, flexed forward midway, sides subparallel, apex truncate. Female genital segment similar but somewhat thicker.

Described from one male, mounted in balsam (paratype?), from Colorado (no data), and one female, in balsam, from Orono, Maine (Patch), June, 1910. Both specimens were kindly loaned to me by Miss Patch.

PSYLLA QUADRILINEATA Fitch.

Psylla quadrilineata FITCH '51: 65.—RILEY '84: 69.—PROVANCHER '86: 305.—LINTNER '93: 64.

Psylla gillettei PATCH '12b: 221.

Very closely related to *americana*, both in structure and color characters, differing as follows: Vertex different in shape, relatively broader and shorter; antennæ relatively longer, nearly twice as long as width of head. Wings with a conspicuous black spot at tip of clavus; pterostigma much smaller. Male forceps narrower at base. Female genital segment thicker dorso-ventrally.

Described from Fitch's type of *quadrilineata*, and one male and two females (paratypes of *gillettei*), from Colorado; the latter are in the Cornell University collection and were determined by Miss Patch. She states ('12b: 221) that some of the specimens were taken on *Salix* sp. in Colorado.

This species is apparently identical with *Psylla gillettei* Patch. Some confusion exists concerning Fitch's types of Psyllidæ. Specimens in the United States National Museum correspond closely with Fitch's descriptions and type numbers and are said to be his types. It is in accordance with this that *P. gillettei* is merged with this species.

PSYLLA ALASKENSIS Ashmead.

Fig. 413.

Psylla alaskensis ASHMEAD '10: 137.

Length of body (male) 1.8 mm.; (female) 2.8; length of forewing 3; width of head 0.87. General color greenish or brownish yellow; a spot on each side of pronotum and indistinct stripes on scutum fuscous or darker; abdomen with narrow, dark cross bands; antennæ darker on apical half or two-thirds.

Vertex about twice as broad as long, bulging forward on each side of front ocellus; with a shallow foveal impression on each side of median line posteriorly; genal cones nearly as long as vertex, subacute, divergent, pubescent; antennæ less than one and a half times as long as width of head. Wings large, hyaline, or slightly browned, venation typical; pterostigma long and large. Legs stout; hind tibiæ scarcely longer than femora, with a distinct spur at base.

Genitalia.—*Male.*—Anal valve longer than forceps, simple, typical in shape; forceps thick at base, converging to an acute point (this is according to Ashmead '**10**: fig. 9). *Female.*—Genital segment about half as long as rest of abdomen, stout; dorsal valve a little longer than ventral, less acute, with long and short setæ.

Described from one female (paratype) from Saldovia, Alaska, July 21, 1899 (T. Kincaid). Other localities: Popoff Island, Shumagin, Islands, Fox Point, all in Alaska (Harriman-Alaska Expedition, July, 1899.)

Type.—Cat. No. 6274, U. S. Nat. Mus.

PSYLLA MAGNICAUDA, new species.

Figs. 319, 489.

Length of body (male) 1.8 mm.; (female) 2.2; length of forewing 3.1; width of head 0.90. General color greenish yellow, antennæ black at tip. Body robust.

Vertex about half as long as broad, emarginate in front at median line and roundly bulging on each side, with two rather shallow foveal impressions; genal cones long, at least as long as vertex, usually longer, slender, moderately divergent, rather acute at apex, pubescent. Antennæ nearly twice as long as width of head.

Thorax well arched. Legs stout; hind tibiæ with a distinct basal spur. Wings slightly tinged with yellow, venation and shape typical; pterostigma small and narrow.

Genitalia.—Male.—Anal valve long, sides subparallel, pubescent; forceps elongate, slender, strongly bowed, reaching nearly to tip of anal valve, acutely pointed. *Female.*—Genital segment unusually large and thick, as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from several males and females from Sheridan, Wyoming (C. W. Metz), August, 1910; Arboles, Colorado (C. F. Baker). These bear the manuscript name of *Psylla americana abdominalis* Crawford.

Type in author's collection.

PSYLLA STRIATA Patch.

Psylla striata PATCH '11:14.

Length of body (male) 1.9 mm.; (female) 2.3; length of forewing 2.7; width of head 0.82. General color greenish yellow, antennæ black or brown on apical third.

Close to *carpinicola*, differing chiefly in antennæ and genal cones; antennæ distinctly shorter, not over twice as long as width of head, often less and relatively thicker; genal cones shorter; body somewhat smaller; wings more flavous; pterostigma moderately broad at base. Male genitalia similar to *carpinicola;* female genital segment relatively a little shorter.

Described from one female (paratype), from Orono, Maine (Patch), on birch (*Betula* sp) June 25, 1910; two from Portland Maine (E. P. Van Duzee), 7-7-'09; several of both sexes from Holderness, New Hampshire (Koebele), on birch, October 2, 1884; several from Polk County, Wisconsin (Baker). Several specimens from Colorado seem to belong to this species, but this is not certain. Several others from Marin County, California, seem to be a varietal form of the species, collected by A. Koebele on *Corylus rostrata,* August 11, 1885; these bear the manuscript name of "*Psylla coryli* n. sp." but are wholly distinct from *P. coryli* Patch.

Miss Patch seems to have identified with her *striata* a number of specimens of a closely related but distinct species from New York State. These have been referred to the species *cephalica.*

The nymphs live on the terminal leaves and shoots of *Betula,* and cover themselves with inconspicuous woolly masses. The mature forms emerge late in June (Patch '11: 14).

PSYLLA CARPINICOLA, new name.

Figs. 86, 91, 262, 317, 473, 478.

Psylla carpini Fitch '51:—Riley '83: 69.—Lintner '93: 64.

Length of body (male) 2.1 mm.; (female) 2.7 to 3; length of fore wing 3; width of head 0.87. General color greenish yellow, antennæ black at tips and on apices of four terminal segments.

Head broad; vertex usually not deeply impressed discally, nearly half as long as broad, emarginate in front at median line; genal cones as long as vertex or often longer, acute to subacute at apex, moderately divergent, pubescent, scarcely deflexed from plane of vertex. Antennæ long and slender, fully two and a half times as long as width of head.

Thorax typical in form. Hind tibiæ with a distinct spur at base. Wings rather clear, sometimes slightly yellow but never so much as in *striata*, venation similar to that of *striata*.

Genitalia.—*Male.*—Anal valve long, narrowed apically, tip broadened somewhat, densely pubescent; forceps long, slightly narrowed midway, with a black tooth at apex. *Female.*—Genital segment longer than rest of abdomen, moderately thick at base and converging to an acute apex; dorsal valve longer than ventral.

Described from several males and females from Polk County, Wisconsin (Baker); Ames, Iowa (Mally), July 1, 1894; Ormsby County, Nevada (Baker). Several of these specimens have been identified as *P. carpini* by C. V. Riley and others, though how authentic this is, is not certain.

Förster, in 1848, named a European species *carpini*. Although this is a synonym of *Psylla mali*, yet it invalidates Fitch's *carpini* which was described in 1851. In order not to change the name too much, since it is so familiar, I have assigned to it the name *carpinicola*.

PSYLLA CEPHALICA, new species.

Figs. 90, 263, 309, 475.

Closely related to *carpinicola*, but a little larger and broader; head distinctly broader, sometimes about 1 mm broad; vertex flatter; genal cones larger, broadly rounded and only a little divergent, about as long as vertex or shorter; antennæ equally long and slender. Legs rather stout. Wings more yellow than in *carpinicola* but less than in *striata;* long branch of cubitus (Cu_1) distinctly more arched than in either of the above species.

Described from several males and females from Texarkana, Arkansas (R. A. Cushman) on *Carpinus caroliniana*, March 20, 1907; Marshall, Texas (Cushman), on *Rubus*, March, 1907; Washington, District of Columbia (Schwarz), August; Mud Creek, Tompkins County, New York, in June, 1904 (determined by Miss Patch as

Psylla striata Patch), Polk County, Wisconsin (Baker). The northern specimens are smaller than the southern forms and come closer to *carpinicola.*

Type in author's collection.

PSYLLA ANNULATA Fitch.

Figs. 77, 80, 258, 301, 466.

Psylla annulata FITCH '51: 64.—ASHMEAD '81: 222.—RILEY '83: 70.—LINTNER '93: 64.—RILEY (in Lintner '93: 411.—MALLY '94: 153.—PATCH '12b: 220.

Length of body (male) 2.1 mm.; (female) 2.7; length of forewing 3.8; width of head 1.08. General color straw-yellow; antennæ straw-yellow, annulated with black on basal half.

Head relatively very broad; vertex not half as long as broad, with a more or less conspicuously constricted annular, stalk-like area between base or inner margin of eye and elevated portion of vertex and posterior ocellus; genal cones longer than vertex, divergent, acute to subacute, pubescent. Antennæ long, about two and a half times as long as width of head, not as slender as in *carpinicola.* Legs rather stout; hind tibiæ with a large spur at base; wings large, clear, or slightly yellowish; pterostigma large.

Genitalia.—Male.—Genitalia similar to *carpinicola. Female.*—Genital segment much shorter than in that species, not as long as rest of abdomen, dorsal valve a little longer than ventral.

Described from one pair from Ames, Iowa (Mally), which seems to fit very well Fitch's brief description. Miss Patch ('**12b**: 219) states that the species is abundant at Middletown, Connecticut, on Rock Maple, *Acer saccharum* Marsh. Fitch stated that the species occurs on maple, so that it seems very probable that this is his species. The black annulation of the antennæ seems to be very constant, and this, together with the fact that it seems to be restricted to the maple, probably indicates that it is a species distinct from the very closely related *negundinis* of Mally.

PSYLLA NEGUNDINIS Mally.

Psylla negundinis MALLY '94: 155.—PATCH '12b: 220.

Exceedingly close to *annulata,* differing chiefly in antennal coloration and in food-plant. Antennæ without black annulation, straw-yellow, except terminal joint black. Food-plant.—*Negundo* sp. (box elder). Were it not for the constant, though slight, difference in color and the difference in food-plants, I should not hesitate to make this species synonymous with *annulata,* as perhaps it is.

Described from several males and females from Ames, Iowa (C. W. Mally), on box elder, August 16, 1894 (determined by Mally); Polk County, Wisconsin (Baker); Colorado (Gillette), no data; several in the National Museum collection with only the data "3658, June 20, '85."

PSYLLA BREVISTIGMATA Patch.

Figs. 92, 93, 264, 308, 484.

Psylla brevistigmata Patch '12b: 222.

Length of body (male) 1.6 mm.; (female) 2.1; length of forewing 2.3 to 2.5; width of head 0.85. General color light reddish brown to red, with more or less conspicuous white markings and stripes; vertex with border more or less continuously white, or at least front margin white; genal cones white on basal half, red distally; pronotum white on posterior half; præscutum bordered with white on hind margin; scutum with longitudinal white or pale stripes; pleuræ and abdomen more or less variegated. These colors may sometimes be more indistinct.

Vertex broadly crescentic, front margin evenly rounded, emarginate at median line, somewhat bulging on each side of front ocellus, with a shallow depression discally on each side. Genal cones thick at base, shorter than vertex, strongly divergent, roundly acute at apex, pubescent. Antennæ about two and three fourths times as long as width of head, slender, black apically.

Thorax rather strongly arched, broad. Hind tibiæ, slender, longer than femora, with a small spur at base behind. Wings about two and a half times as long as broad, hyaline, slightly yellowish along veins in distal third or half; pterostigma broad at base but short, less than half as long as Rs.

Genitalia.—*Male.*—Anal valve slightly longer than forceps, simple, broad from posterior view; forceps acute at tip, arched toward each other rather strongly, sides subparallel, pubescent. *Female.*—Genital segment not as long as rest of abdomen, dorsal valve a little longer than ventral and less acute at apex, with a number of short, thick setæ at tip.

Described from two females (paratypes) from Alta Meadows, Sequoia National Park, California (9,000 feet), July 19, 1907 (J. C. Bradley); these paratypes are in the collection of Cornell University, Department of Entomology; one male from California (no data), which bears the manuscript name of *Psylla albirufa* Crawford; one male from Santa Clara County, California (Koebele), September, 1885, on *Cercocarpus parviflorus* Nuttall; six from Los Angeles, California (Koebele), April; several from Santa Cruz Mountains, California (Koebele); these differ slightly in the male forceps and may be a varietal form; Siskiyou County, California (Koebele); Colorado (no data).

Whether or not certain variations in the male genitalia in these forms indicate distinct species, it is difficult to say. For the present, at least, these will be called merely varietal forms of the one species. In size and coloration of body also there seems to be considerable variation, but this is due probably to differences in local environment.

PSYLLA BREVISTIGMATA MAGNA, new variety.

Similar to the species, except in the male forceps, which are longer and diagonally truncate at the apex.

Several males and females from Utah; one from Ormsby County, Nevada (Baker).

Type.—Cat. No. 18111, U. S. Nat. Mus.

PSYLLA BREVISTIGMATA ACUTA, new variety.

Close to the species, but differing in the male forceps, which are more slender, more acuminate, and are turned forward in distal third, terminating in a blunt apex.

Several males and females from the mountains near Claremont, California (Crawford), on foliage of *Pinus ponderosa*, elevation 10,000 feet, July, 1911; Wasatch Mountains, Utah (Koebele), on *Cercocarpus ledifolius*, June 20, 1885.

Type.—Cat. No. 18112, U. S. Nat. Mus.

PSYLLA FLOCCOSA Patch.

Figs. 82, 142, 251, 302, 467.

Psylla floccosa PATCH '09: 301; '10: 29; '11: 11.

Length of body (male) 2.1 mm; (female) 3.8; length of forewing 4.8; width of head 0.98 to 1.05. General color greenish yellow, sometimes with a brownish tinge; distal antennal segments black.

Vertex not half as long as broad, with two shallow foveæ, front ocellus rather sunken in emargination at median line. Genal cones longer than vertex, not strongly divergent, large, subacute or narrowly rounded at apex, sometimes densely pubescent. Antennæ not quite three times as long as width of head, slender.

Thorax strongly arched, coarsely punctate. Pronotum long. Legs moderately large; hind tibiæ slightly longer than femora, basal spur small or almost wanting; apical spines conspicuous, seven or eight in number. Wings very large, broad at apex, transparent; venation typical; pterostigma almost or wholly wanting; veins flavous.

Genitalia.—*Male.*—Anal valve long, converging toward tip, pubescent; forceps long, rather slender, converging in distal portion to a simple, acute, black point. *Female.*—Genital segment as long as rest of abdomen or longer, somewhat subglobose in basal fourth or fifth, thence abruptly narrowed and slender, styliform, dorsal valve slightly upturned at tip, a little longer than ventral.

Described from one female (metatype) from Orono, Maine (Patch), July 6, 1909, on *Alnus incana* Willdenow; Lake Temagami, Ontario, Canada, August 12, 1906 (W. J. Palmer;) Oakland, Maryland (Hubbard and Schwarz), July 9; Toland, Colorado (Cockerell), on *Alnus tenuifolia*, August, 1911; Placer County, California (Koebele), on *Alnus incana*, September. Some of these bear the manuscript name of *Psylla styliformis* Crawford.

Nymph.—Adult nymphs are oval in shape, flattened, about 3.19 mm in length more or less; head and thorax pale green, abdomen pale yellow; eyes bright pink; tips of antennæ, legs, and beak dusky; densely covered with a white, flocculent fluffy mass, appearing, as Miss Patch very aptly described them, as "walking ostrich plumes."

"The eggs are probably deposited upon the alder in the fall, as the newly-hatched psyllids appear about the time the alder leaves are unfolding in the spring, and settle upon the ventral surface of the leaves" (Patch '**10**: 301). Adults emerge about the middle or latter part of June, in Maine.

PSYLLA ASTIGMATA, new species.

Figs. 87, 256, 257, 311, 471.

Length of body (male) 2.3 mm; (female) 3; length of forewing 4.8; width of head 0.95. General color yellowish green throughout, antennæ brown or black except three basal joints.

Vertex not half as long as broad, roundly concave between elevated posterior ocelli; genal cones about as long as vertex, divergent, rather acute to subacute at apex, pubescent. Antennæ nearly three times as long as width of head.

Thorax typical. Legs long; hind tibiæ a little longer than femora, with basal spur small or almost wanting. Wings very large, clear; venation typical; pterostigma small or wanting.

Genitalia.—*Male.*—Anal valve similar in form to that of *floccosa;* forceps broad, black at apex, with apical margin distinctly emarginate or bifid; the degree of this emargination varies; anterior subapical margin sometimes roundly emarginate, making a long median tooth. *Female.*—Genital segment short and thick, not as long as rest of abdomen, nearly or fully half as thick dorso-ventrally as long; dorsal valve a little longer than ventral.

Described from several males and females from Polk County, Wisconsin (Baker); Manitou, Colorado (Gillette); September; Placer County, California (Koebele), on *Prunus demissa,* October; Sisson, California (J. C. Bradley), August 19, 1908; Easton, Washington (Koebele).

Type in author's collection.

PSYLLA TRIMACULATA Crawford.

Psylla alni trimaculata CRAWFORD '**11c**: 631.

Very close to *astigmata,* and perhaps not specifically distinct; differs chiefly in having three large and very prominent red spots on thoracic dorsum, one on anterior half of praescutum, and one on each side of scutum. Genal cones more acutely pointed.

Described from two females, one from Gowanda, New York (E. P. Van Duzee), August 2, 1907, and one from Lake Placid, New York, August 15, 1896 (C. S. Sheldon).

Type in author's collection.

PSYLLA CERASI Patch.

Psylla cerasi PATCH '**12b**: 223.

Very close to *astigmata*, differing chiefly in being very strikingly red to vermillion in color instead of greenish; "head and thorax rosy, dorsal abdomen almost vermillion, a black spot on dorsum of first abdominal segment, five vivid transverse black bands across abdominal dorsum, the last coming just cephalad the genital segment. Antennal joints I to III rosy, rest black: eyes bright black: wings clear and a little brownish, ventral body pale." (Patch '**12b**: 233.) The one paratype (♀) which Miss Patch has kindly loaned to me does not show these color characters, since it has been mounted in balsam. Vertex and genal cones resembling more closely *astigmata* than *trimaculata*. Wings very large; medial vein closer to radial sector than in *astigmata*.

Described from one female (paratype ♀), in balsam, from Stillwater, Maine (Patch), on wild cherry (*Prunus cerasus* ?), September 14, 1911. The eggs, supposedly of this species, were found on the same date between the leaf buds and twigs.

More biological data or more extensive collections will be necessary before the true relationships of this and the two preceding species can be ascertained. It is possible that all three will prove to be but variations of one species.

PSYLLA ALNI AMERICANA, new variety.

Figs. 4, 10, 11, 15, 85, 89, 260, 307, 310, 477.

Length of body (male) 3 mm.; (female) 3.8; length of forewing 4.3; width of head 1.08. General color yellowish green, antennæ black or brown distally.

Similar to *floccosa* but vertex relatively shorter, only about one-third as long as broad, as long as pronotum; genal cones short, about as long as vertex or often distinctly shorter, broadly rounded at apex or sometimes broadly subacute, pubescent. Antennæ nearly or fully three times as long as width of head. Basal spur of hind tibiæ usually large and conspicuous. Wings typical in form and venation; pterostigma large, sometimes moderately narrow; wings clear, sometimes slightly flavous.

Genitalia.—*Male.*—Anal valve long, converging to a narrow apex; forceps long, narrow, broadened in apical third or fourth (from side view), apex truncate, either straight or slightly emarginate on truncate margin. *Female.*—Genital segment slender, usually longer than rest of abdomen, dorsal valve longer than ventral.

Described from several hundred specimens of both sexes from: Claremont, California (Crawford), July, 1911, on *Alnus rhombifolia*; Stanford University, California (Crawford), on same host, September, 1911, and May, 1912; Visalia, California (J. C. Culbertson); Ormsby

County, Nevada (C. F. Baker). Some of these bear the manuscript name of *Psylla alni gossypiona* Crawford, having been separated from the variety *americana* on too slight differences.

Type in author's collection.

Nymphs.—Abundant on the lower surface of the alder leaves in summer and fall, conspicuous because of the dense white flocculent substance with which they cover themselves, as described for *floccosa;* length 1.8 to 2.5 mm. Color pale brownish, or often brown; caudal half of abdomen darker, with dark cross-bands on basal half.

PSYLLA CAUDATA, new species.

Figs. 88, 259, 305, 472.

Length of body (male) 2.2 mm.; (female) 4.1; genital segment of female 1.9; length of forewing 4.3; width of head 0.98. General color brown to blackish; dorsum of head and thorax with irregular pale stripes, bands, or spots; antennæ and legs brown to fuscous; abdomen mostly blackish.

Vertex less than half as long as broad, relatively a little longer than in preceding species, less concave; genal cones large, as long as vertex, rounded at apex or often subacute, pubescent. Antennæ over two and a half times as long as width of head.

Thorax strongly arched. Hind tibiæ with large basal spur. Wings clear, transparent; veins black and prominent, venation typical; pterostigma moderately large.

Genitalia.—*Male.*—Anal valve not much longer than forceps, abruptly narrowed just before apex; forceps moderately long, somewhat enlarged at apex, apex truncate and bifid or rather deeply emarginate, as in *astigmata.* *Female.*—Genital segment extremely long, nearly as long as rest of body, very slender, acuminate and curved upward in caudal third or half, very acute at apex, dorsal valve longer than ventral; with an apparent suture across both valves near the center.

Described from several males and females from Tolland, Colorado (Cockerell), on *Alnus tenuifolia,* August, 1911; Pagosa Springs, Colorado (Baker); several others with data "Colo," and no more.

Type in author's collection.

PSYLLA GALEAFORMIS Patch.

Fig. 144.

Psylla galeaformis PATCH '11:12.

Length of body (male) 2.2 mm.; (female) 3.8; genital segment of female 1.3; length of forewing 4.2; width of head 0.96. General color orange to reddish brown, sometimes rather dark; paler ventrad; thorax with paler markings, somewhat as in *caudata,* but less conspicuous.

Similar to *caudata* in most respects, but genal cones usually more acute; antennæ nearly three times as long as width of head; hind tibiæ with a moderately large spur at base. Wings similar but often tinged with yellow. Male anal valve and forceps longer than in *caudata;* forceps more slender and less enlarged at apex. Female genital segment less elongate, relatively thicker and not upcurved at apex, less than one-third as long as rest of body, without an apparent suture across the middle.

Described from one female (paratype) from Orono, Maine (Patch), on *Alnus incana,* July 26, 1905; several males and females from Stamford, New York (Van Duzee), June 6, 1909; Holderness, New Hampshire (Koebele), October, 1884; Ottawa, Ontario, Canada (W. Metcalfe), on "Alder," August 3, 1904; Marquette, Michigan (Hubbard and Schwarz), July 27; Easton, Washington (Koebele).

PSYLLA TORRIDA, new species.

Figs. 96, 269, 312, 474.

Length of body (male) 1.6 mm.; (female) 2.1; length of forewing 2.3; width of head 0.70. General color orange to red; abdomen blackish ventrad; antennæ black on apical three-fourths.

Head scarcely as broad as thorax; vertex elevated roundly (when viewed from directly above it) in front on each side of median line, postocellar areas strongly elevated, somewhat pubescent. Genal cones about two-thirds as long as vertex, more or less separated at base and quite strongly divergent, rounded to subacute at apex, with a few long blackish hairs. Antennæ extremely long and slender, more than four times as long as width of head.

Thorax rather strongly arched, somewhat pubescent. Hind tibiæ with a relatively large spur at base. Wings small, less than twice as long as broad, rather squarish on apical margin, clear or slightly tinged with yellow; costal margin distinctly setose; pterostigma small, opaque-yellow.

Genitalia.—*Male.*—Anal valve small, rather cylindrical, not much longer than forceps, somewhat flared out cup-like at apex; forceps ovoid, flattened, about twice as long as broad (in lateral aspect), pubescent; with a slender, crotch-shaped structure arising between forceps from caudal end of genital segment, and the two slender capitate arms lying close to the inner surface of forceps. *Female.*—Genital segment nearly as long as rest of abdomen, dorsal valve longer than ventral and less acute; ventral valve very acute at tip; pubescence long and stiff.

Described from four males and five females from Para, Brazil (C. F. Baker). This and the following two species, all tropical, are sharply distinguished by the extremely long antennæ, and are closely interrelated in many respects, and it is quite possible that they should be placed in a distinct genus.

Type in author's collection.

PSYLLA ORIZABENSIS, new species.

Figs. 95, 479.

Closely related to *torrida*, differing as follows: Larger; body (female) 2.6 mm. long; forewing 3; head relatively a little broader. Vertex less emarginate in front at median line. Wings longer, over two and a fourth times as long as broad, rounded at apex, yellowish, venation similar, but pterostigma distinctly larger. Female genital segment a little longer.

Described from one female from Orizaba, Mexico (Crawford), August 20, 1910.

Type in author's collection.

PSYLLA MINUTICONA, new species.

Figs. 94, 480.

Length of body (male) 1.7 mm.; (female) 2.1; length of forewing 2.2; width of head 0.68. General color greenish yellow to light orange; antennæ flavous on basal half, rest black.

Resembling *torrida*, but smaller ; vertex almost straight across front margin, rounded down from base toward genal cones almost as in *Calophya;* genal cones very short and rounded, not as long as their width at base, with a few rather long hairs; antennæ as in *torrida*. Wings about twice as long as broad, clear or slightly yellowed, broadly rounded at apex, venation similar; pterostigma small, as in *torrida*.

Genitalia.—*Male.*—Anal valve similar to *torrida;* forceps of same type, flat-ovoid, about two-thirds as broad as long, with a similar crotch-shaped structure between them. *Female.*—Genital segment similar, but shorter.

Described from one male and two females from Champerico, Guatemala (C. F. Baker).

Type in author's collection.

DOUBTFUL SPECIES.

PSYLLA RECTICEPS Provancher.

Psylla recticeps PROVANCHER '86: 305.

This seems to be a species of *Aphalara*, and were it not for the fact that the wing is described as acute, I would have no hesitation in assigning it to that genus. The description of the wings suggests *Trioza*. In his key to the genera, Provancher describes *Psylla* as "head square in front, anterior margin slightly emarginate; antennæ nearly as long as body;" this is apparently *Aphalara*. *Diraphia* is described as "head cleft in front, forming on each side a conical projection"—apparently *Psylla*.

It was described by Provancher as follows:

> *Psylla recticeps* n. sp.—Length 0.12 inch; color greenish yellow; head short, transverse, emarginate in front, with a median impressed line and a depression on each

side of it; ocelli light red, two near posterior margin of eyes, third in anterior emargination. Eyes green or brown, large, prominent; antennæ long, slender, two basal joints longest, II longer than I; terminal joint a little thickened, with two setæ. Rostrum 3-jointed, large, tip black. Prothorax short, rounded on front margins; mesonotum large, transverse. Wings transparent, yellowish, veins rather prominent; median vein forming a cell at the acute apex of the wing, enlarged at base and flexed above. Venter and legs concolorous; abdominal segments margined with red. Common on bushes. Cape Rouge, Isle de la Madelaine.

DIRAPHIA QUADRICORNIS Provancher.

Diraphia quadricornis Provancher '86: 306.

This appears to be identical with *Psylla galeaformis* Patch, but because of the uncertainty I am unwilling to refer the latter to this name.

According to Provancher it was described as follows:

Length 0.20 inch; color green with orange tinge; cephalic cones, legs, and antennæ slightly lighter; antennæ green at base, then lighter, black at tip, almost as long as body. Wings entirely hyaline, veins prominent. Metacoxal spurs large, acute. Female abdomen large, stout, brownish at extremity.

Cape Rouge, Ottawa. Common.

DIRAPHIA SANGUINEA Provancher.

Diraphia sanguinea Provancher '86: 307.

This suggests *Psylla cerasi* Patch, and is perhaps identical with it.

It was described by Provancher as follows:

Length 0.13 inch; color reddish to black; three lobes of mesonotum blood-red; tip of rostrum, abdominal segment margins and tarsal spines black. Head pale beneath, red above. Wings hyaline, triangular terminal cell very long and narrow. Abdomen striped red and black. Genital segment long, pointed, conical.

Cape Rouge.

PSYLLA DUVAUÆ Scott.

Psylla duvauæ Scott '821: 443.—Jhering '85: 129.

A South American species.

PSYLLA, sp. (?)

A few apparently new species are not sufficiently represented in the collection to be described as new, but illustrations of them are included herewith, in figs. 81, 97, 303, 313, 469, 481.

EUROPEAN SPECIES.

For the sake of comparison, several European species have been illustrated in the plates, but no description is given in the text:

Livia juncorum Latreille (figs. 22, 23, 218, 271, 427); *Euphyllura phillyreae* Forster (figs. 35, 224, 274, 430); *Euphyllura olivina* Costa (figs. 223, 429); *Floria spectabilis* Flor (figs. 44, 226, 435); *Floria radiata* Forster (Alloeoneura) (figs. 45, 277, 437); *Aphalaroida ericae* Curtis (Rhinocola) (figs. 55, 291, 460); *Aphalaroida succincta* Heeger (Rhinocola) (figs. 54, 238, 459); *Amblyrhina cognata* Loew (figs. 71, 72, 247, 457); *Psyllopsis fraxini* Linnaeus (figs. 231, 282, 440); *Psylla crataegi* Forster (fig. 320); *Psylla alni* Linnaeus (fig. 476); *Psylla pyri* Linnaeus (fig. 395).

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EXPLANATION OF PLATES.

LIST OF ABBREVIATIONS.

A.—anal vein.
a.—anus.
ac.—axillary cord.
ant.—antenna.
ap.—apodeme.
asc.—accessory sclerite.
cl.—clypeus.
Cu.—cubitus.
cx.—coxa.
e.—eye.
epm.—epimeron.
eps.—episternum.
f.—frons.
fp.—forceps (male).
fu.—furcae.
g.—gena.
gc.—genal cone.
lab.—labium.
labr.—labrum.
M.—media.
mc.—meracanthus.
mn.—mandibular seta.
mx.—maxillary seta.
o.—ocellus.
P.—pronotum.
p.—penis.
Psc.—praescutum (dorsulum).
pt.—parapteron.
ptb.—preocular tubercle (*Livia.*)
PN.—Pseudonotum.
R.—radius.
Rs.—radial sector.
S.—sternum.
Sc.—subcosta.
Scl.—scutellum.
sp.—spiracle.
tn.—trochantin.
v.—vertex.
w.—wing.
wp.—wing process.

PLATE 1.

[Structure of skeleton.]

FIG. 1. ***Arytaina robusta***, lateral view showing sclerites of head and thorax. (See above for explanation of abbreviated terms.) Stippled areas are conjunctival membrane. Dotted lines indicate endoskeleton.

2. ***Apsylla cistellata***, lateral view of thorax. Compare metathorax with that of (1).

3. ***Livia vernalis***, lateral view of head and thorax.

4. ***Psylla alni americana***, lateral view of thorax.

5. ***Psylla pyri***, cephalic view of head, showing the sclerites and suppression of the frons.

PLATE 2.

[Structure of skeleton.]

6. ***Euphyllura arbuti***, sclerites of thorax.

7. ***Trioza albifrons***, same.

8. ***Psylla pyricola***, same, with base of abdomen, also.

9. ***Apsylla cistellata***, ventral view of head and thorax.

10. ***Psylla alni americana***, metacoxa, metafurcæ, part of epimeron, metasternum and chitinous process from metafurcæ connecting the endoskeleton with the inner surface of the exoskeleton. The episternum and most of the epimeron is removed.

11. Same, caudal view.

12. ***Apsylla cistellata***, caudal view of metathorax, partially diagrammatic, showing comparatively simple metafurcæ.

PLATE 3.

[Structure of skeleton.]

13. ***Psylla pyricola*** (male), lateral view of abdomen, distended, showing segments, spiracles, and atrophied and modified sclerites.

14. Same, female.

FIG. 15. *Psylla alni americana*, showing frons, clypeus, labrum, labium, etc.
16. *Paurocephala magnifrons*, front view of head, showing frons, clypeus, etc.
17. *Apsylla cistellata*, corresponding view as in (16), but actually ventral.
18. *Aphalara veaziei*, same.
19. *Phacopteron lentiginosum*, same.
20. *Livia coloradensis*, same.
21. *Psyllopsis fraxinicola*, same, more enlarged.

PLATE 4.

[Lateral and cephalic views of head.]

22. *Livia juncorum*, lateral aspect.
23. Same, cephalic aspect.
24. *L. vernalis*, ventral aspect.
25. *L. maculipennis*, cephalic.
26. *L. vernalis*, lateral.
27. *L. coloradensis*, cephalic.
28. *L. caricis*, lateral.
29. *Rhinocola aceris*, ventral aspect.
30. Same, cephalic.
31. Same, lateral.
32. *Eupyllura arctostaphyli*, lateral.
33. *Livia coloradensis*, lateral.
34. *Euphyllura arctostaphyli*, cephalic.
35. *Eu. phillyreæ*, lateral.
36. Same, cephalic.

PLATE 5.

[Views of head.]

37. *Ceriacremum setosum*, cephalic.
38. *Euphalerus nidifex*, cephalic.
39. *E. vermiculosus*.
40. *E. nidifex*, lateral.
41. *E. vermiculosus*, lateral.
42. *Arytaina genistæ*, lateral.
43. *Ceriacremum setosum*, lateral.
44. *Floria spectabilis*, lateral.
45. *F. radiata*, lateral.
46. *Psyllopsis mexicana*, lateral.
47. *P. fraxinicola*, lateral.
48. *P. fraxini*, lateral.
49. Same, cephalic.
50. *Arytaina robusta*, lateral.
50a. Same, cephalic.
51. *A. fuscipennis*, lateral.
52. *A. pubescens*.
53. *A. amorphæ*.
54. *Aphalaroida succincta*.
55. *A. ericæ*.
56. *Arytaina robusta*.
57. *A. assimilis*.
58. *A. ceanothæ*.
59. *Aphalaroida pithecolobia*.
60. *Arytaina minuta*.

PLATE 6.

[Views of head.]

FIG. 61. *Katacephala arcuata*, lateral.
62. Same, cephalic.
63. *Pachypsylla vesiculum*.
64. *P. mamma*.
65. *P. venusta*, cephalic.
66. Same, lateral.
67. *P. gemma*.
68. *Heteropsylla mexicana*.
69. *H. cubana*.
70. *H. texana*.
71. *Amblyrhina cognata*, lateral.
72. Same, cephalic.
73. *Paurocephala magnifrons*.
74. *Calophya triozomima*.
75. *C. californica*.
76. *C. nigripennis*.
77. *Psylla annulata*.
78. *Mitrapsylla albalineata*, cephalic.
79. Same, lateral.
80. *Psylla annulata*.
81. *Psylla* sp. (not described).
82. *P. floccosa*.

PLATE 7.

[Views of head.]

83. *Arytaina ribesiæ*.
84. Same.
85. *Psylla alni americana*.
86. *P. carpinicola*.
87. *P. astigmata*.
88. *P. caudata*.
89. *P. alni americana*.
90. *P. cephalica*.
91. *P. carpinicola*.
92. *P. brevistigmata*.
93. Same, cephalic.
94. *P. minuticona*.
95. *P. orizabensis*.
96. *P. torrida*.
97. *Psylla* sp. (not described).
98. *P. fibulata*.
99. *P. minuta*.
100. *P. maculata*.
101. *P. americana*.

PLATE 8.

[Views of head and genitalia.]

102. *Paurocephala ilicis*, lateral.
103. Same, cephalic.
104. Same, male cauda.
105. Same, forceps, caudal view.
106. *Aphalara calthæ*, cephalic.

FIG. 15. [illegible]
16. [illegible]
17. [illegible]
18. [illegible]
19. [illegible]
20. [illegible]
21. [illegible]

[illegible] part of antenna.
[illegible] genitalia.
[illegible] male forceps.
[illegible] segment.

PLATE 9.

[Views of head and genitalia.]

[illegible] head.
[illegible] caudal view.
[illegible] male forceps.
[illegible]us, head.
[illegible] female cauda.
[illegible] male cauda.
[illegible]anis, head.
[illegible], male forceps, caudal view.
[illegible] view.
[illegible] male cauda.
[illegible]uryli, head.
[illegible], male forceps.
[illegible] male cauda.
[illegible] longipennis, head.
[illegible], female cauda.
[illegible], male forceps.
[illegible]formis, female cauda.
[illegible], same.

PLATE 10.

[Views of head and male cauda.]

[illegible] concolor, head, lateral aspect.
[illegible], head.
[illegible], head.
[illegible] gigantea, head.
[illegible], cephalic view of head.
[illegible] gigantea, same.
[illegible] corniculata, head, lateral.
[illegible] Same, cephalic.
[illegible] Rhinopsylla jalapensis, lateral.
[illegible] Same, cephalic.

FIG. 156. *Ceropsylla johnsonii*, head, lateral.
157. *Epicarsa corniculata*, male cauda.
158. *Ceropsylla johnsonii*, same.
159. *Carsidara concolor*, same.
160. *C. mexicana*, same.

PLATE 11.

[Views of head and male cauda.]

161. *Aphalara calthæ*, head, lateral-aspect.
162. *A. angustipennis*, same.
163. *A. veaziei*, same.
164. *A. rumicis*, same.
165. *A. calthæ*, same.
166. *A. picta*, same.
167. *A. nebulosa kincaidi*, same.
168. *A. pulchella*, same.
169. *A. minutissima*, same.
170. *A. calthæ*, male cauda.
171. Same.
172. *A. veaziei*, same.
173. *A. picta*, same.
174. *A. nebulosa kincaidi*, same.
175. *A. nebulosa kincaidi*, same.
176. *A. pulchella*, same.
177. *A. minutissima*, same.
178. *Rhinopsylla jalapensis*, same.

PLATE 12.

[Views of head.]

179. *Trioza diospyri*, lateral.
180. *Leuronota maculata*, lateral.
181. Same, cephalic.
182. *Trioza viridis*, cephalic.
183. Same, lateral.
184. *T. frontalis*, lateral.
185. *T. collaris*, cephalic.
186. *Leuronota acutipennis*.
187. *Trioza collaris*.
188. *T. albifrons*.
189. *T. arizonæ*.
190. *T. maura*.
191. *T. salicis*.
192. *T. maura*.
193. *T. longicornis*.
194. *T. varians*.
195. *T. salicis*.
196. Same, cephalic.
197. *Paratrioza arbolensis*.

PLATE 13.

[Views of head.]

198. *Trioza tripunctata*, lateral.
199. *T. magnoliæ*.
200. *Paratrioza arbolensis*.
201. *Trioza longistylus*.

[illegible]

[illegible]

[illegible]

[illegible]

51. Psylla [illegible]

FIG. 252. *Arytaina ribesiæ.*
253. Same, variation in size.
254. *Psylla alba.*
255. *Pachypsylla venusta.*
256. *Psylla astigmata*, tip of male forceps.
257. Same, male cauda.
258. *P. annulata.*
259. *P. caudata.*
260. *P. alni americana.*
261. *P. minuta.*
262. *P. carpinicola.*
263. *P. cephalica.*
264. *P. brevistigmata.*
265. *P. americana.*
266. *P. fibulata.*
267. *P. sinuata.*
268. Same, caudal view.
269. *P. torrida.*

PLATE 16.

[Views of female cauda.]

270. *Livia vernalis.*
271. *L. juncorum.*
272. *Ceriacremum setosum.*
273. *Rhinocola aceris.*
274. *Euphyllura phillyreæ.*
275. *Livia coloradensis.*
276. *Arytaina genistæ.*
277. *Floria radiata.*
278. *Ceriacremum setosum* (tibial spur).
279. *Euphyllura arctostaphyli.*
280. *Psyllopsis fraxinicola.*
281. *Euphalerus nidifex.*
282. *Psyllopsis fraxini.*
283. *Arytaina robusta.*
284. *Aphalaroida pithecolobia.*
285. *Arytaina robusta.*
286. *A. minuta.*
287. *A. pubescens.*
288. *A. fuscipennis.*
289. *A. amorphæ.*
290. *A. ceanothæ.*
291. *Aphalaroida ericæ.*

PLATE 17.

[Views of female cauda.

292. *Pachypsylla vesiculum.*
293. *Heteropsylla mexicana.*
294. *H. cubana.*
295. *H. texana.*
296. *Paurocephala magnifrons.*
297. *Calophya triozomima.*
298. *C. californica.*
299. *C. nigripennis.*

FIG. 300. *Mitrapsylla albalineata.*
301. *Psylla annulata.*
302. *P. floccosa.*
303. *Psylla* sp. (not described).
304. *Arytaina ribesiæ.*
305. *Psylla caudata.*
306. *Arytaina ribesiæ.*
307. *Psylla alni americana.*
308. *P. brevistigmata.*
309. *P. cephalica.*
310. *P. alni americana.*

PLATE 18.

[Views of female cauda.]

311. *Psylla astigmata.*
312. *P. torrida.*
313. *Psylla* sp. (not described).
314. *P. fibulata.*
315. *P. maculata.*
316. *P. minuta.*
317. *P. carpinicola.*
318. *P. americana.*
319. *P. magnicauda*
320. *P. cratægi.*
321. *P. alba.*
322. *P. pruni.*
323. *P. viburni.*
324. *P. pyrisuga.*
325. *P. mali.*
326. *P. melanoneura.*
327. *P. terminalis.*
328. *P. foersteri.*
329. *P. hippophæs.*

PLATE 19.

[Views of male and female cauda.]

330. *Paratrioza cockerelli.*
331. Same, variation in anal valve.
332. *Neotriozella immaculata.*
333. *Rhinopsylla antennata.*
334. *Trioza tripunctata*, female cauda.
335. *T. salicis.*
336. *T. quadripunctata.*
337. *T. salicis.*
338. *T. longistylus.*
339. *T. nicaraguensis.*
340. *T. mexicana.*
341. *T. salicis.*
342. *T. frontalis.*
343. *T. magnoliæ.*
344. *T. albifrons.*
345. *Paratrioza arbolensis.*
346. *Kuwayama medicaginis.*
347. *K. oaxacensis.*
348. *Paratrioza cockerelli.*
349. *Neotriozella laticeps.*

PLATE 20.

[Views of male and female cauda.]

FIG. 350. *T. collaris.*
351. *T. viridis.*
352. *Leuronota maculata.*
353. *Trioza viridis.*
354. *T. maura.*
355. *T. frontalis.*
356. *T. diospyri.*
357. *T. arizonæ.*
358. *T. frontalis.*
359. Same, caudal view.
360. *T. diospyri.*
361. *T. albifrons.*
362. *T. frontalis.*
363. *T. arizonæ.*
364. *T. salicis.*
365. *T. maura.*
366. *T. quadripunctata.*
367. *T. longicornis.*
368. *T. tripunctata.*
369. *T. varians.*
370. *T. maura.*
371. Same, forceps of male, lateral.
372. Same, male cauda.

PLATE 21.

[Views of male and female cauda.]

373. *Carsidara gigantea*, female cauda.
374. *C. dugesii.*
375. *C. concolor.*
376. *Rhinopsylla jalapensis.*
377. *Aphalara calthæ.*
378. *A. angustipennis.*
379. *A. pulchella.*
380. *A. calthæ.*
381. *A. minutissima.*
382. *A. calthæ.*
383. *A. picta.*
384. *A. rumicis.*
385. *Carsidara mexicana* (tibial spur).
386. *Aphalara veaziei.*
387. *Trioza salicis*, male cauda.
388. *T. proximata*, same.
389. *T. mexicana.*
390. *T. magnoliæ.*
391. *Paratrioza arbolensis.*
392. *P. maculipennis.*
393. *Kuwayama medicaginis.*

PLATE 22.

[Wings, etc.]

394. *Trioza brevlantennata*, head.
395. *Psylla pyri*, explaining wing venation.
396. *Trioza breviantennata*, male cauda.
397. *Aphalaroida acaciæ.*

FIG. 398. *A. inermis.*
399. *A. spinifera.*
400. *Euphalerus propinquus.*
401. *Trioza lobata.*
402. *Hemitrioza sonchi.*
403. *Aphalara alaskensis.*
404. *Aphalaroida prosopis.*
405. *Leuronota longipennis.*
406. *Euphalerus rugipennis.*

PLATE 23.

[Wings.]

407. *Ceropsylla sideroxyli.*
408. *Freysuila dugesii.*
409. *Rhinopsylla athenæ*
410. *Paurocephala ilicis.*
411. *Uhleria mira.*
412. *Arytaina chelifera.*
413. *Psylla alaskensis.*
414. *Trioza stylifera.*
415. *Kuwayama dorsalis.*
416. *Katacephala grandiceps.*
417. *Freysuila cedrelæ.*
418. *Tetragonocephala flava.*
419. *Calophya flavida.*
420. *C. dubia.*
421. *Trioza alacris.*
422. *T. breviantennata.*

PLATE 24.

Wings.]

423. *Livia vernalis.*
424. *L. caricis.*
425. *L. maculipennis.*
426. *L. coloradensis.*
427. *L. juncorum.*
428. *Rhinocola aceris.*
429. *Euphyllura olivina.*
430. *E. phillyreæ.*
431. *E. arctostaphyli.*
432. *Ceriacremum setosum.*
433. *Euphalerus nidifex.*
434. *E. vermiculosus.*
435. *Floria spectabilis.*
436. *Arytaina genistæ.*
437. *Floria radiata.*
438. *Psyllopsis mexicana.*
439. *P. fraxinicola.*

PLATE 25.

[Wings.]

440. *Psyllopsis fraxini.*
441. *Arytaina amorphæ.*
442. *A. ceanothæ.*
443. *A. pubescens.*
444. *A. robusta.*
445. Same, variation in color.

FIG. 446. *A. minuta.*
447. *A. fuscipennis.*
448. *A. assimilis.*
449. *Aphalaroida pithecolobia.*
450. *Katacephala arcuata.*
451. *Pachypsylla venusta.*
452. *P. mamma.*
453. *P. gemma.*
454. *P. vesiculum.*
455. *Heteropsylla mexicana.*
456. *H. texana.*
457. *Amblyrhina cognata.*
458. *Heteropsylla cubana.*
459. *Aphalaroida succincta.*
460. *A. ericæ.*

PLATE 26.

[Wings.]

461. *Paurocephala magnifrons.*
462. *Calophya triozomima.*
463. *C. californica.*
464. *C. nigripennis.*
465. *Mitrapsylla albalineata.*
466. *Psylla annulata.*
467. *P. floccosa.*
468. *Arytaina ribesiæ.*
469. *Psylla* sp. (not described).
470. *Arytaina ribesiæ.*
471. *Psylla astigmata.*
472. *P. caudata.*
473. *P. carpinicola.*
474. *P. torrida.*
475. *P. cephalica.*

PLATE 27.

[Wings.]

476. *Psylla alni.*
477. *P. alni americana.*
478. *P. carpinicola.*
479. *P. orizabensis.*
480. *P. minuticona.*
481. *Psylla* sp. (not described).
482. *P. fibulata.*
483. *P. minuta.*
484. *P. brevistigmata.*
485. *P. maculata.*
486. *P. americana.*
487. *P. americana.*
488. *P. americana.*
489. *P. magnicauda.*
490. *P. alba.*
491. *P. sinuata.*

PLATE 28.

[Wings.]

492. *Carsidara gigantea.*
493. *Rhinopsylla jalapensis.*
494. *Carsidara dugesii.*

FIG. 495. *C. concolor.*
496. *C. mexicana.*
497. *Epicarsa corniculata.*
498. *Ceropsylla johnsonii.*
499. *Aphalara pulchella.*
500. *A. calthæ.*
501. *A. rumicis.*
502. *A. angustipennis.*
503. *A. angustipennis.*
504. *A. calthæ.*
505. *A. veaziei.*
506. *A. picta.*
507. *A. minutissima.*
508. *A. nebulosa kincaidi.*

PLATE 29.

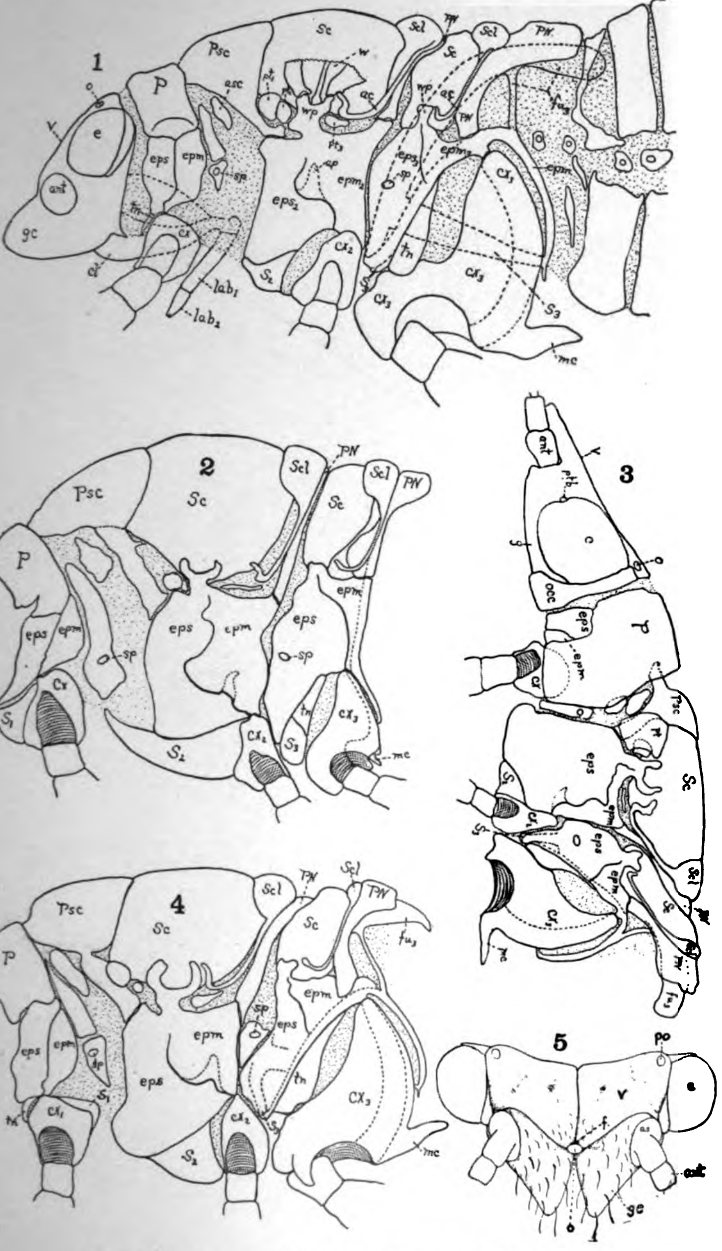
[Wings.]

509. *Trioza collaris.*
510. *Leuronota maculata.*
511. *Trioza viridis.*
512. *Leuronota acutipennis.*
513. *Trioza frontalis.*
514. *T. albifrons.*
515. *T. arizonæ.*
516. *T. salicis.*
517. *T. maura.*
518. *T. frontalis.*
519. *T. diospyri.*
520. *T. maura.*
521. *T. longicornis.*
522. *T. maura.*
523. *T. varians.*

PLATE 30.

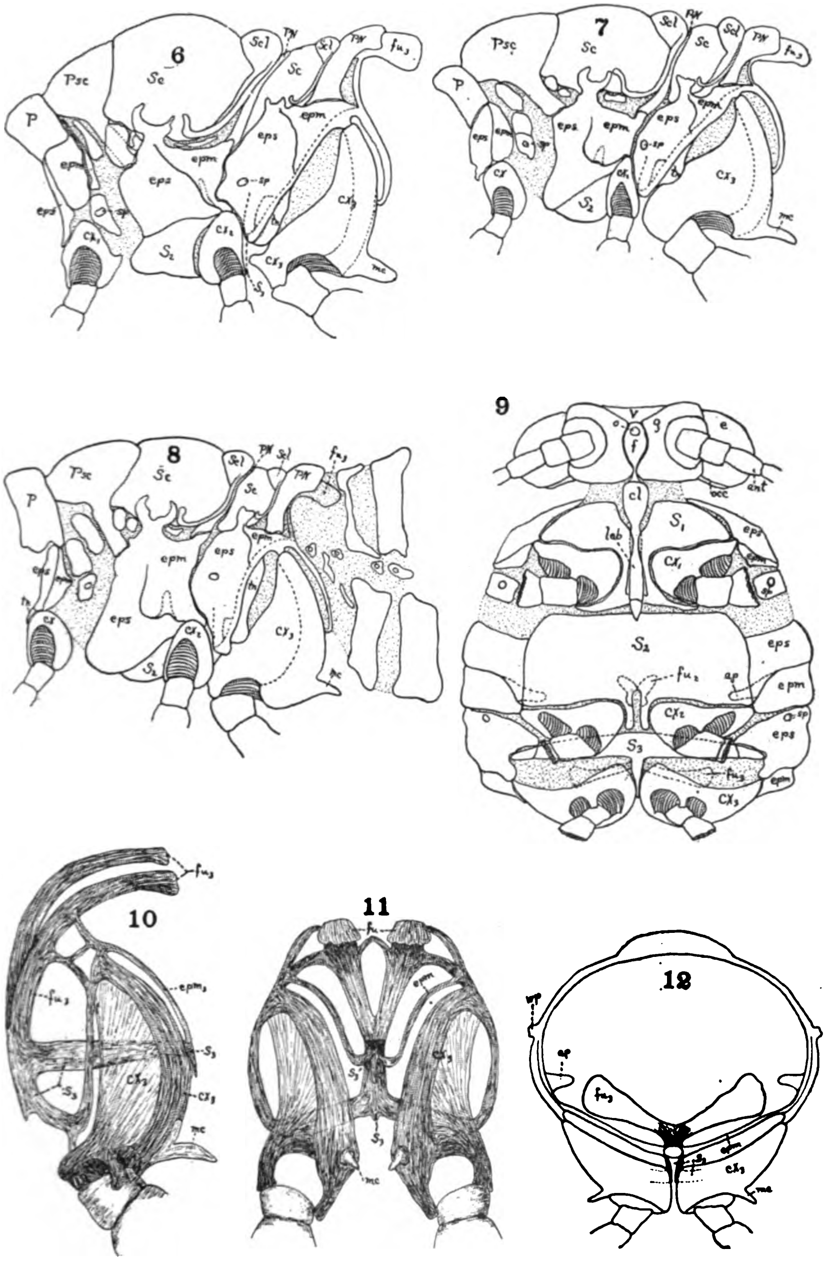
[Wings.]

524. *Trioza tripunctata.*
525. *T. salicis.*
526. *T. salicis.*
527. *T. quadripunctata.*
528. *T. longistylus.*
529. *T. proximata.*
530. *T. salicis.*
531. *T. mexicana.*
532. *Paratrioza arbolensis.*
533. *Trioza magnoliæ.*
534. *T. nicaraguensis.*
535. *Paratrioza cockerelli.*
536. Same.
537. *Kuwayama medicaginis.*
538. *Neotriozella laticeps.*
539. *N. immaculata.*
540. *Kuwayama oaxacensis.*
541. *Rhinopsylla antennata.*



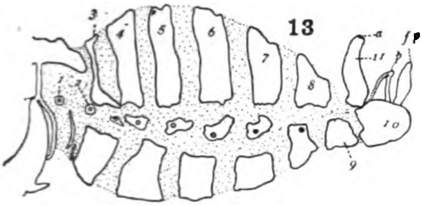
SCLERITES OF THE HEAD AND THORAX OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 171.



EXTERNAL AND INTERNAL SKELETON OF THE THORAX.

FOR EXPLANATION OF PLATE SEE PAGE 171.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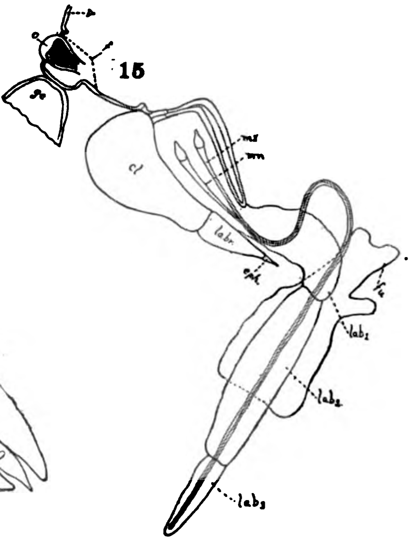
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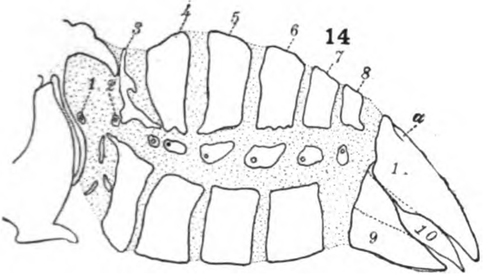
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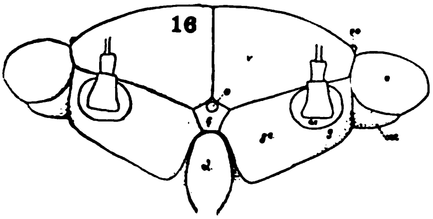
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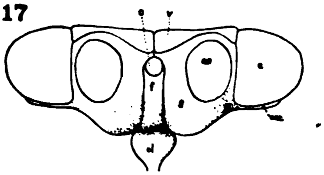
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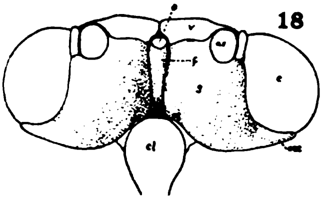
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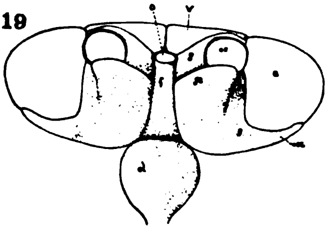
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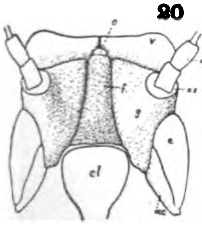
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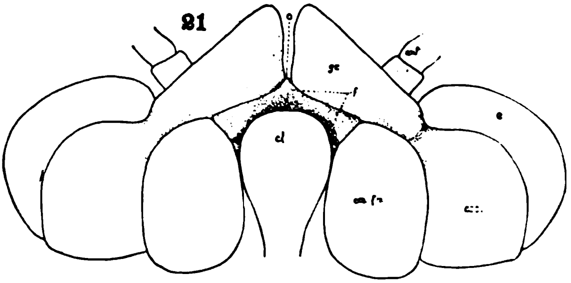
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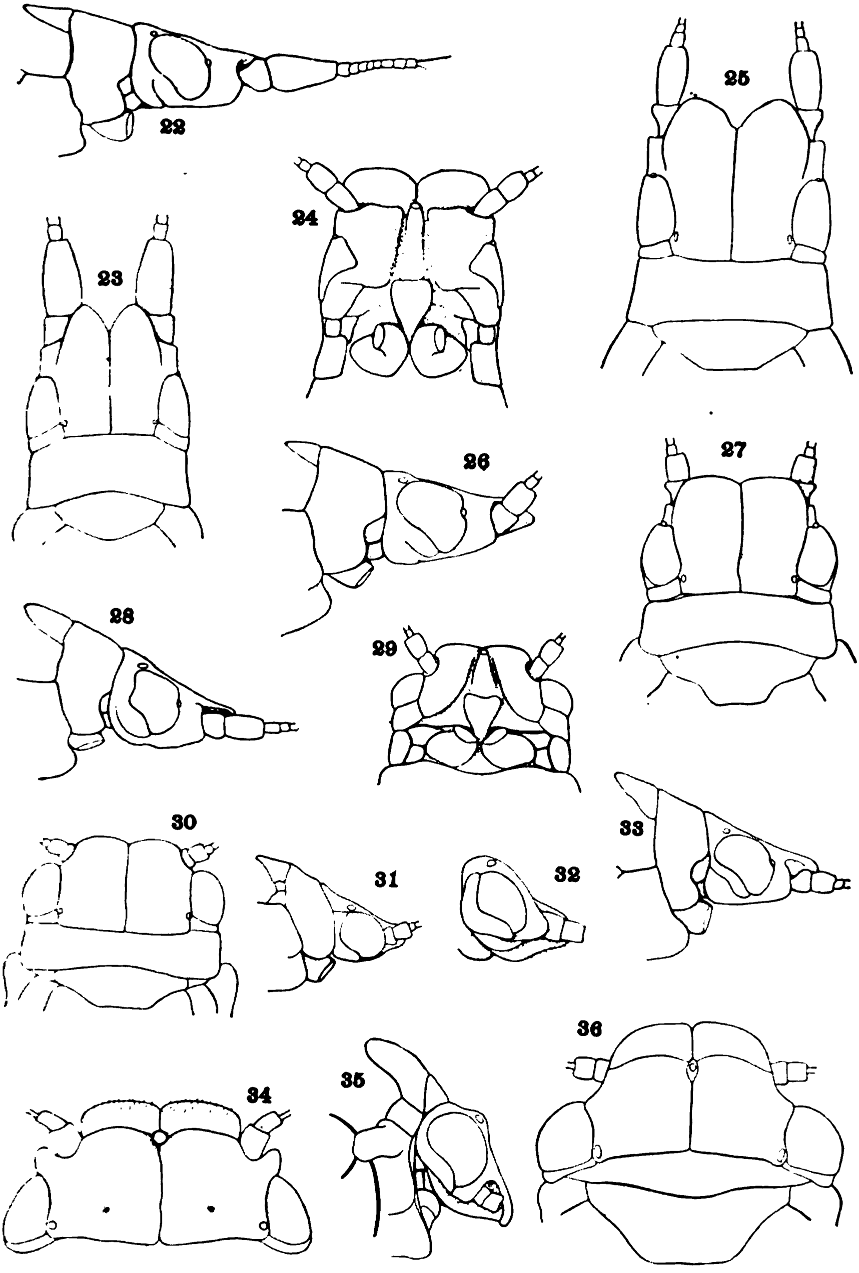
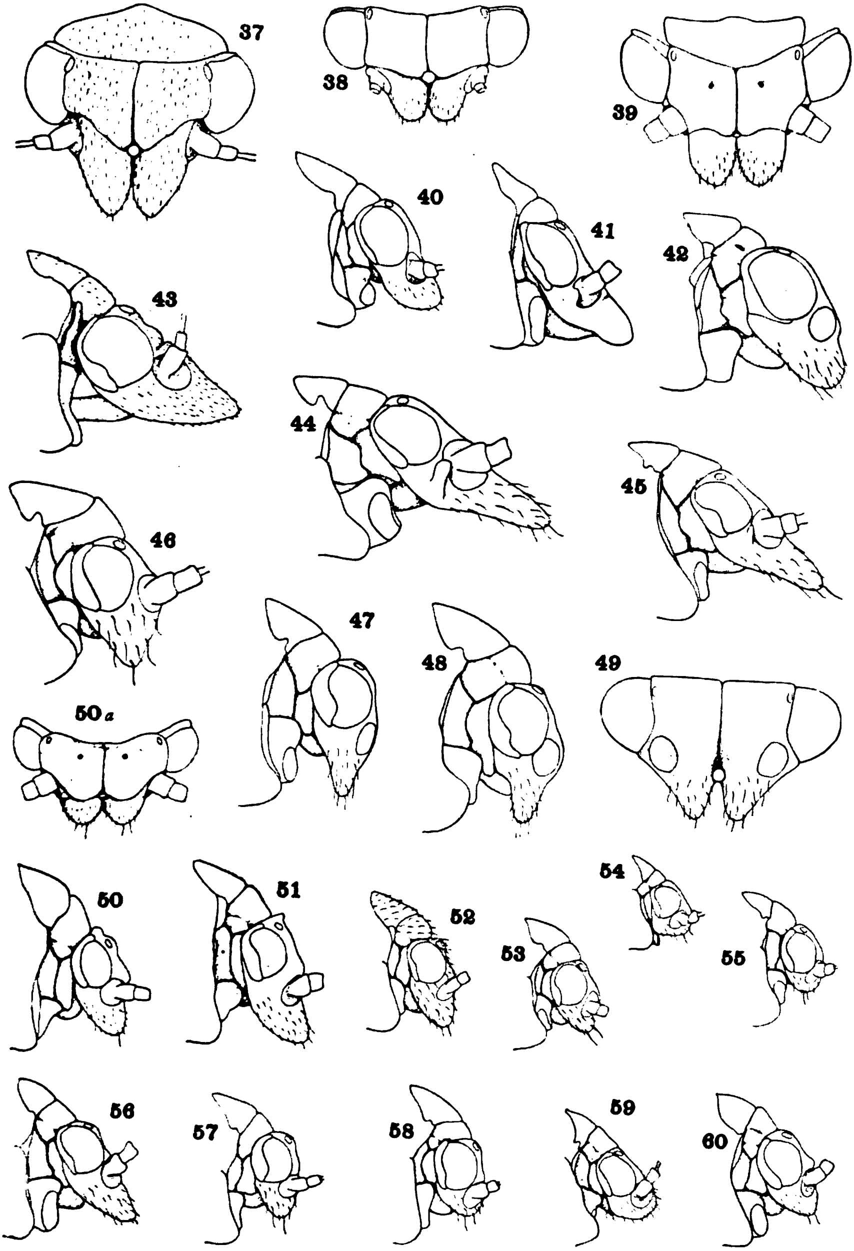
SCLERITES OF THE HEAD AND THE ABDOMEN.

FOR EXPLANATION OF PLATE SEE PAGES 171 AND 172.



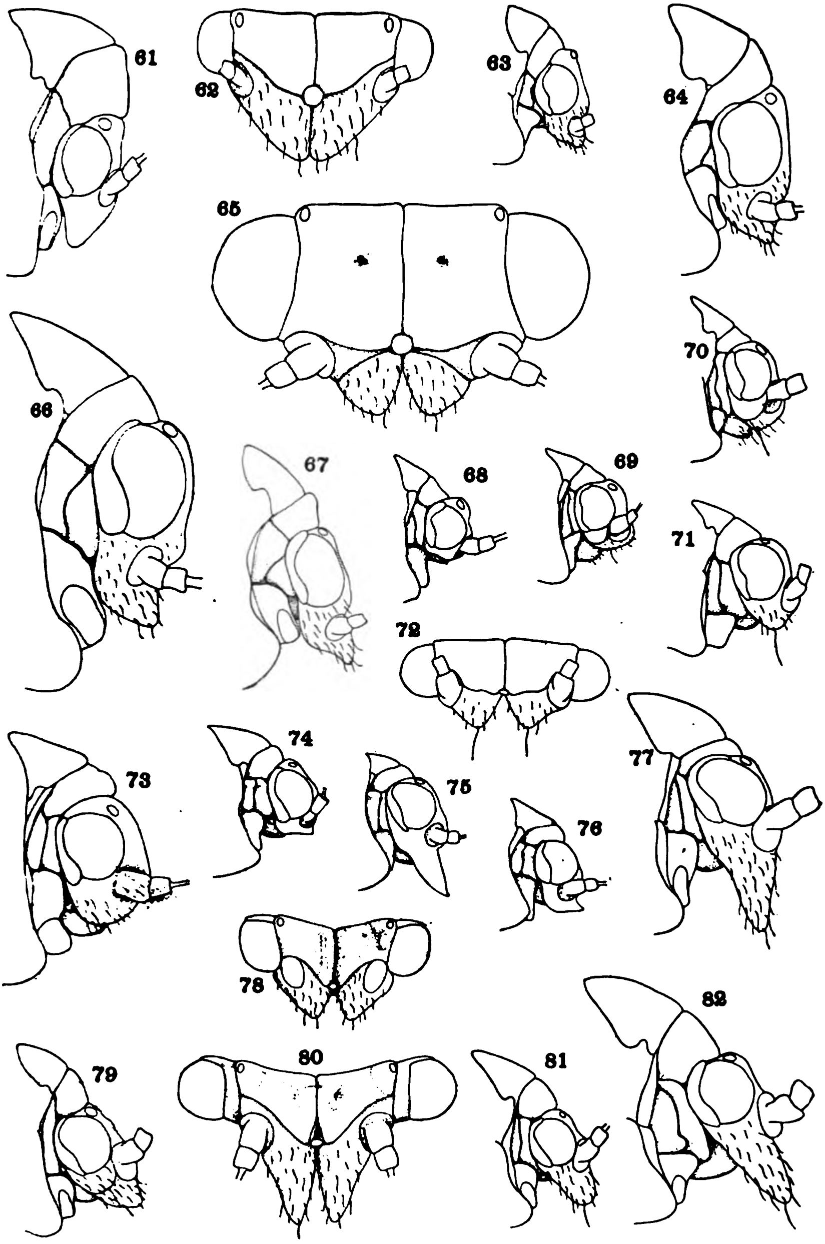
DORSAL, LATERAL, AND VENTRAL ASPECTS OF THE HEAD OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 172.



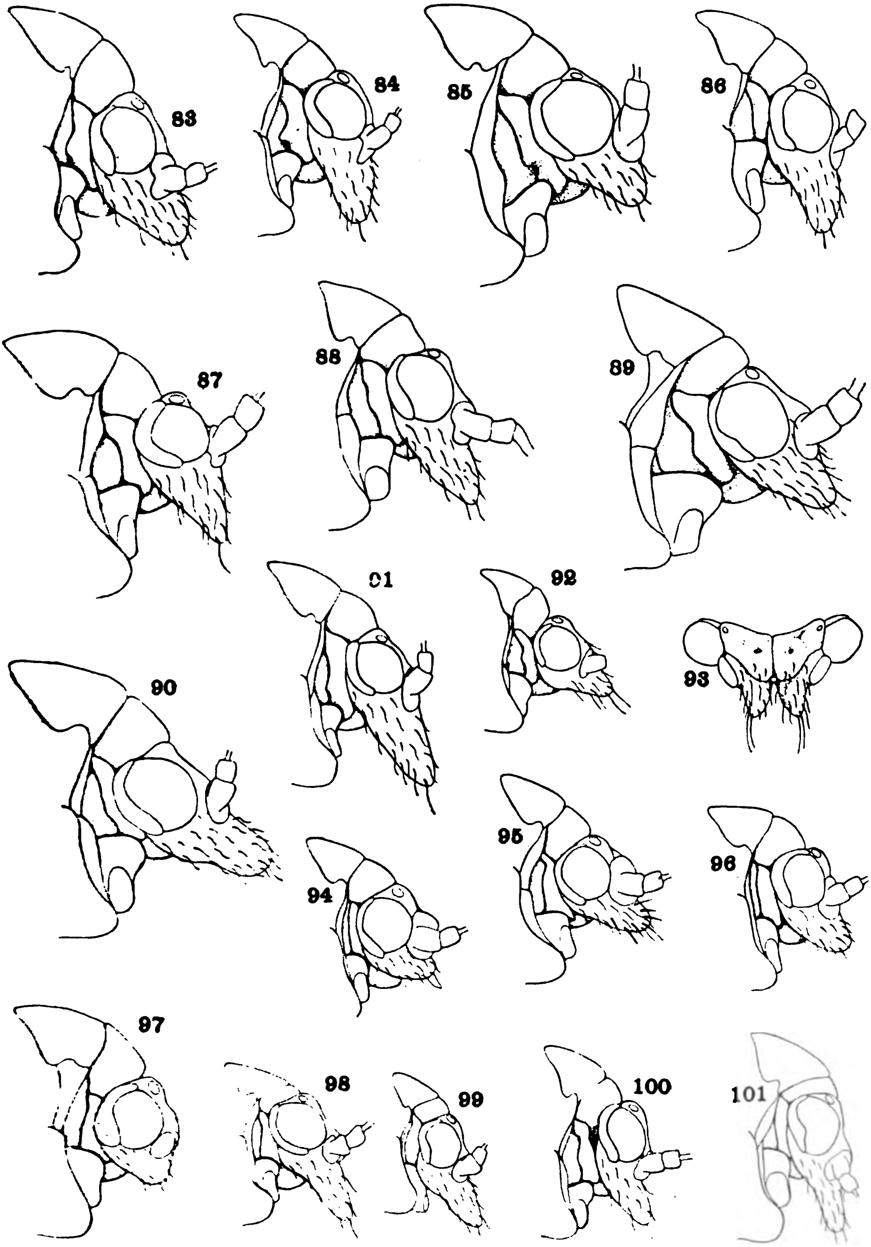
DORSAL AND LATERAL ASPECTS OF THE HEAD.

FOR EXPLANATION OF PLATE SEE PAGE 172.



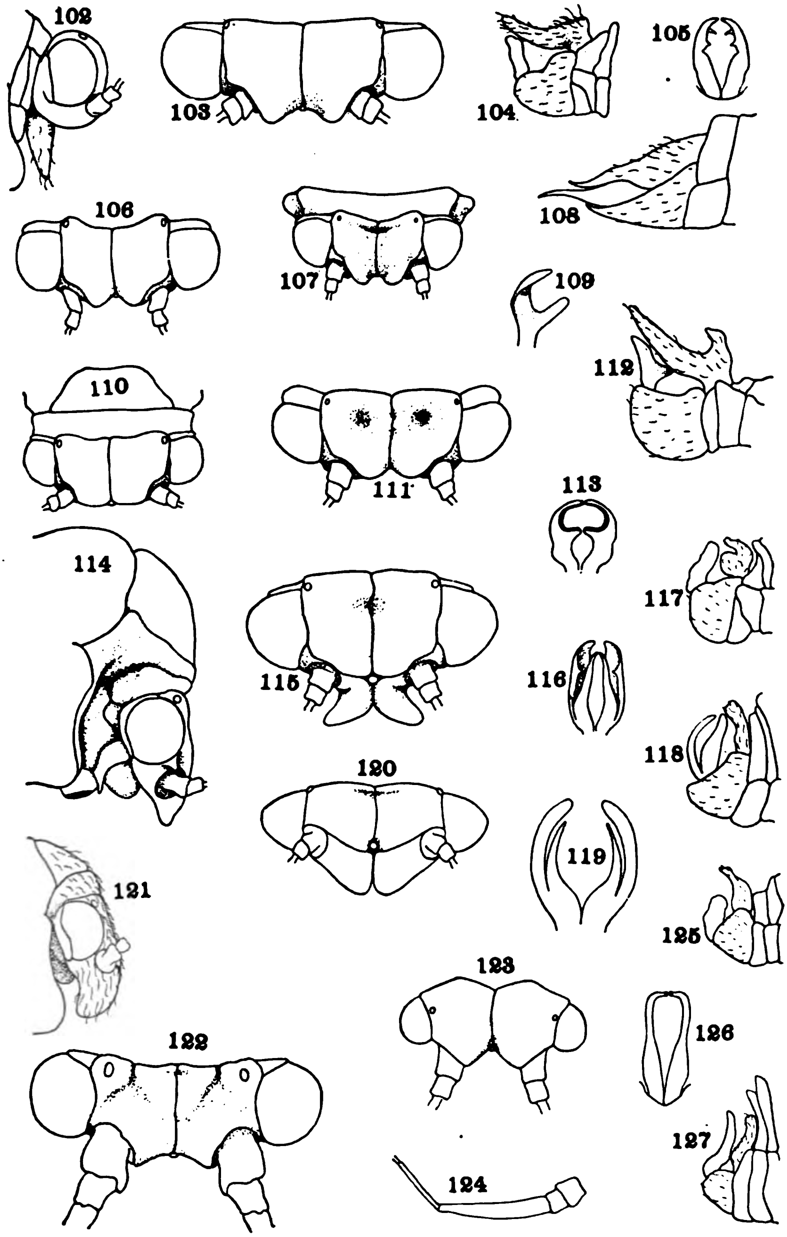
DORSAL AND LATERAL ASPECTS OF THE HEAD

FOR EXPLANATION OF PLATE SEE PAGE 173.



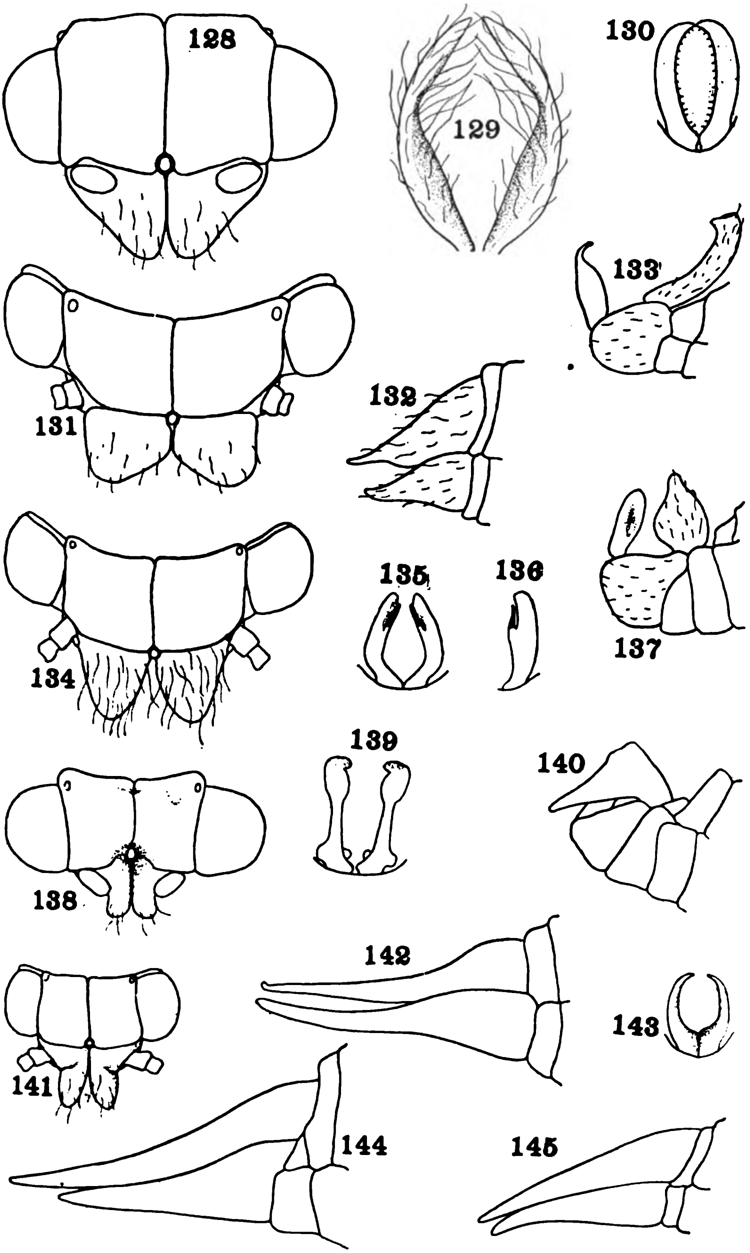
DORSAL AND LATERAL ASPECTS OF THE HEAD.

FOR EXPLANATION OF PLATE SEE PAGE 173.



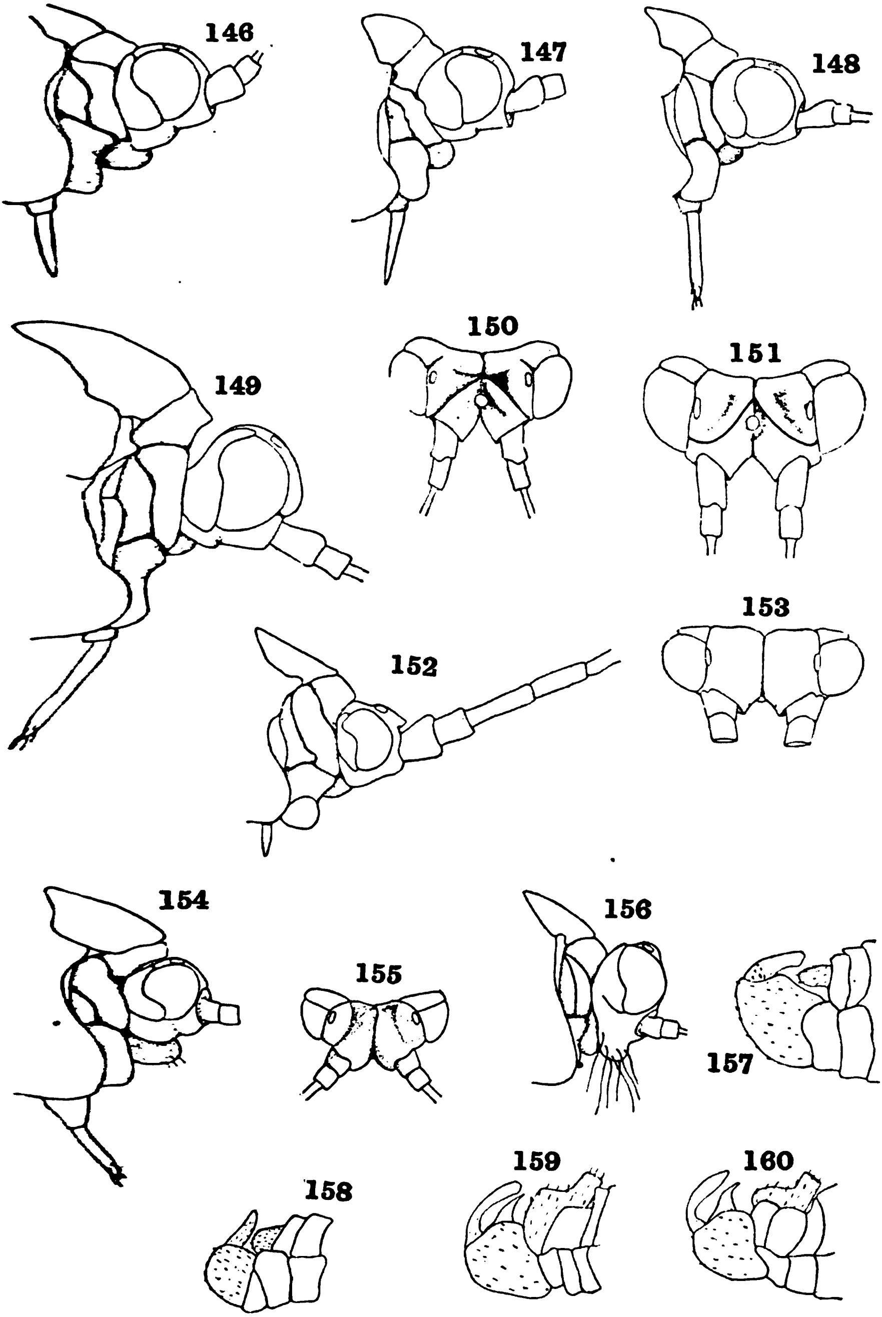
VIEWS OF THE HEAD AND MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 173 AND 174.



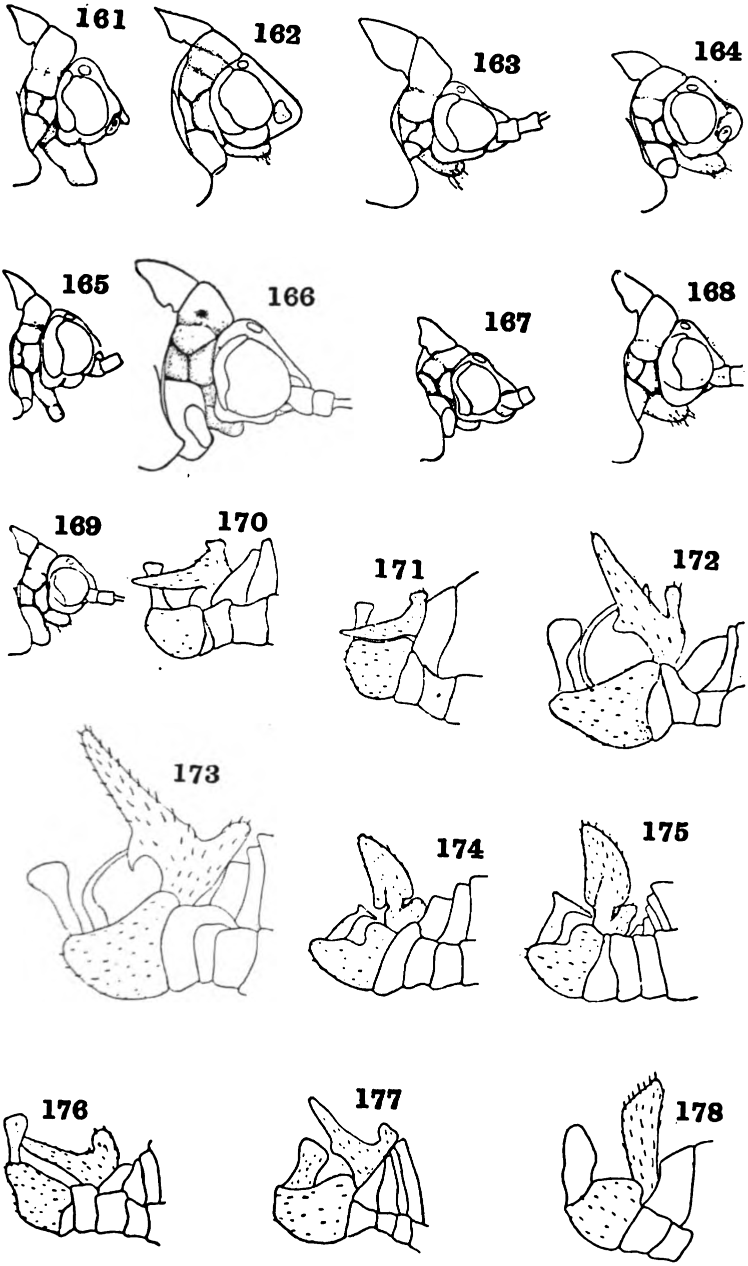
VIEWS OF THE HEAD AND CAUDA OF BOTH SEXES

FOR EXPLANATION OF PLATE SEE PAGE 174.



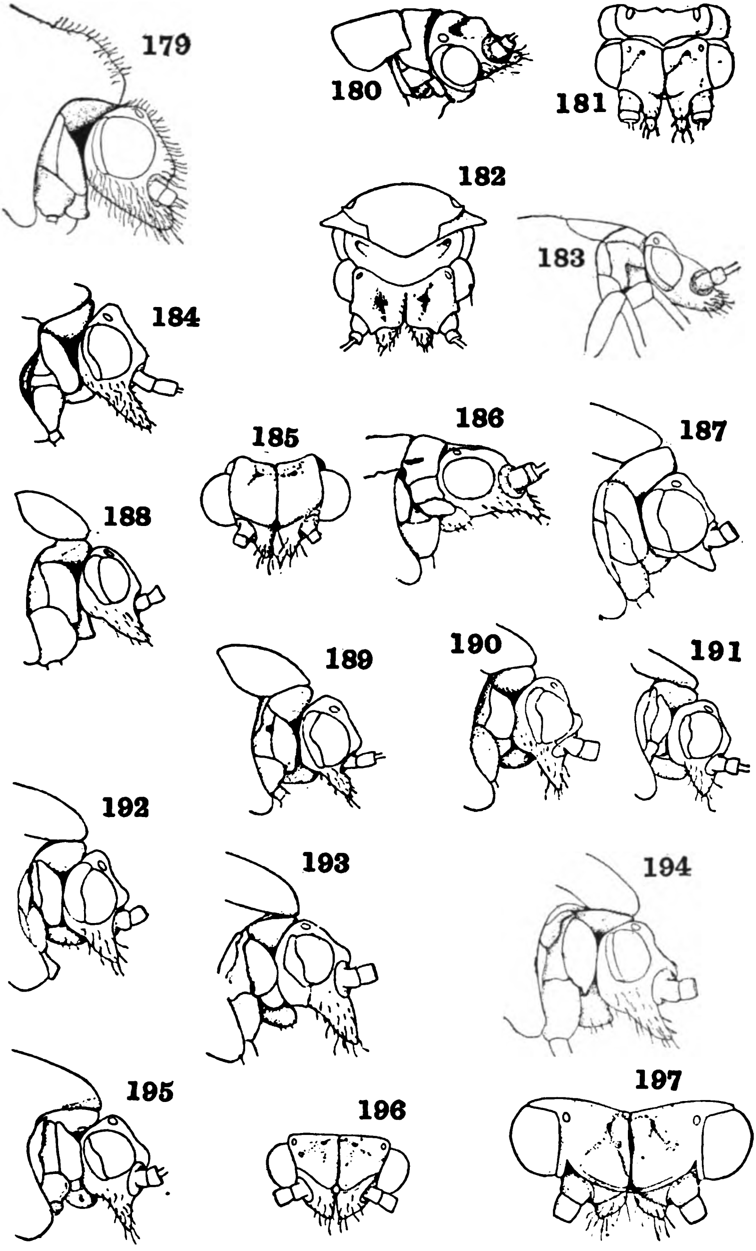
VIEWS OF THE HEAD AND MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 174 AND 175.



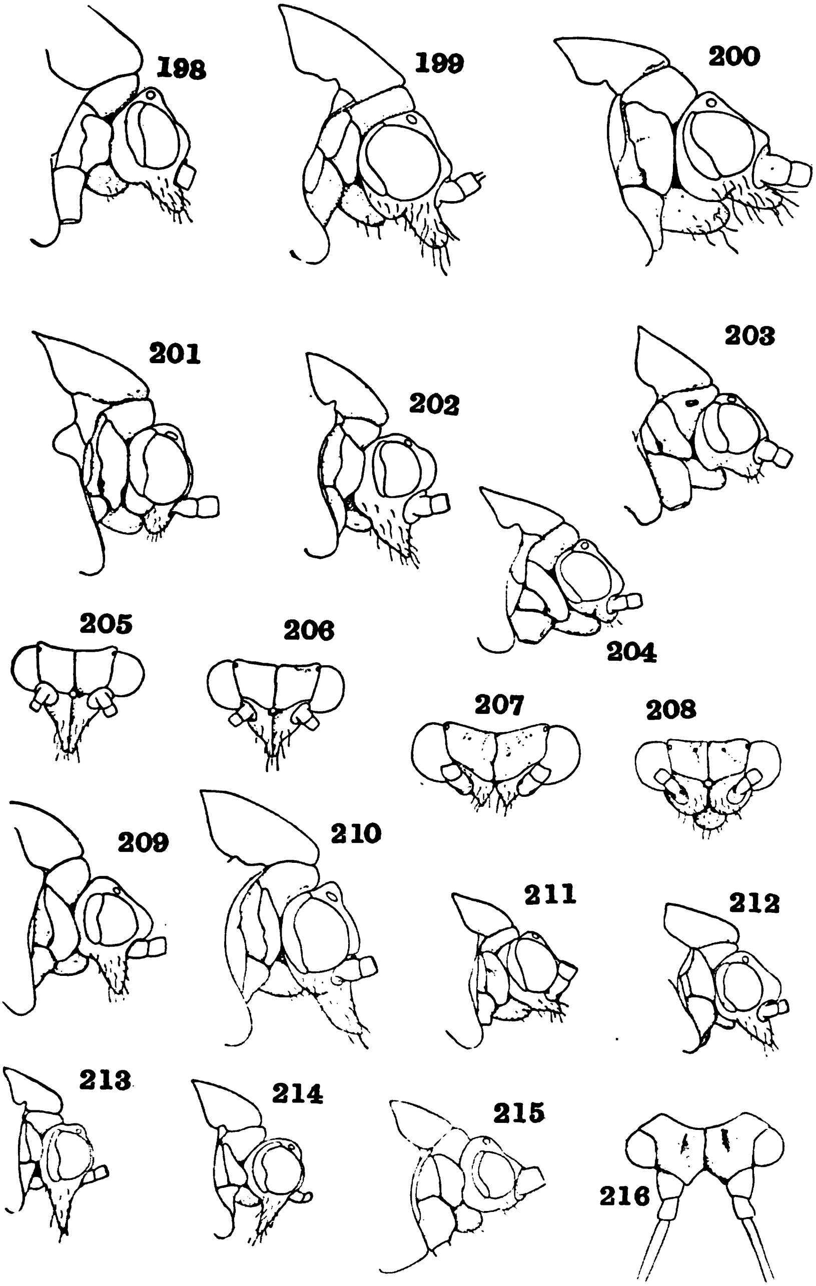
HEAD AND MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 175.



Dorsal and Lateral Aspects of the Head.

For explanation of plate see page 175.



DORSAL AND LATERAL ASPECTS OF THE HEAD.

FOR EXPLANATION OF PLATE SEE PAGES 175 AND 176.

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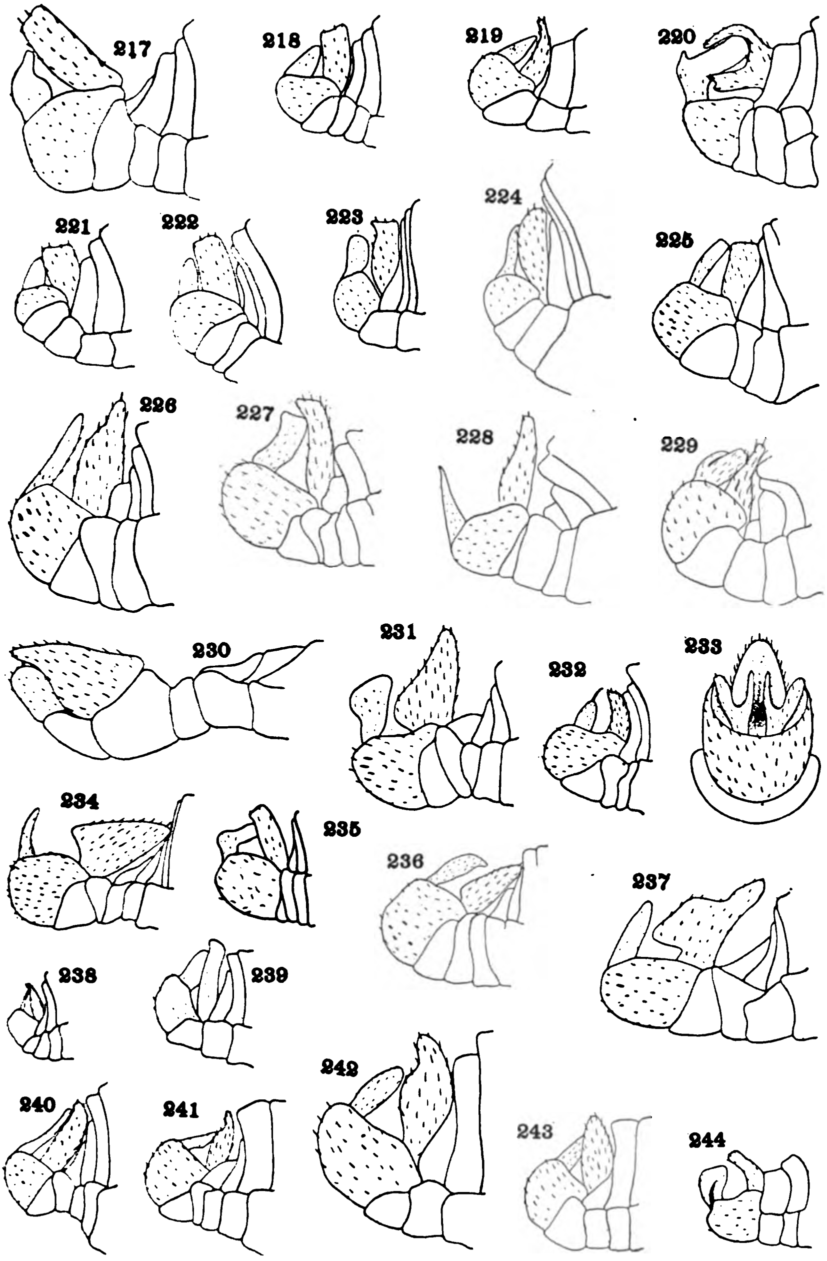
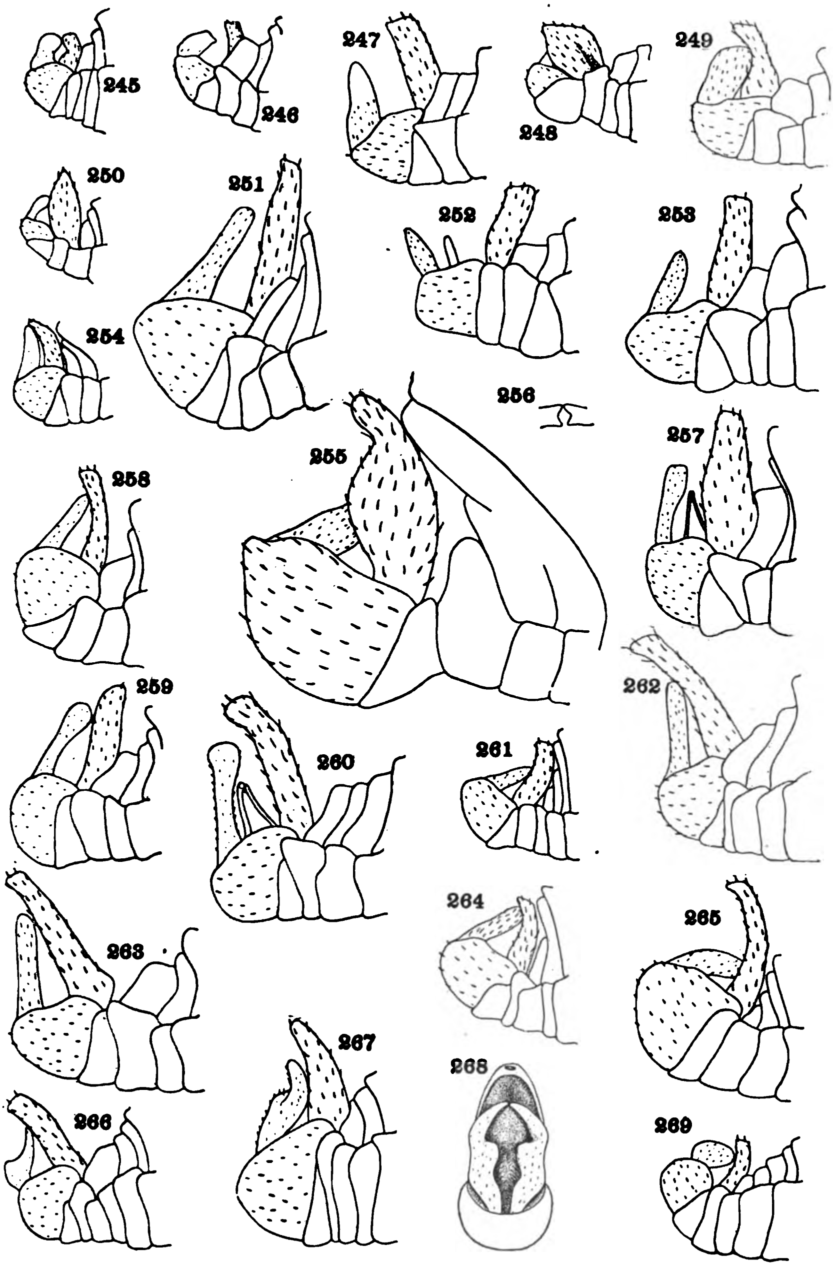


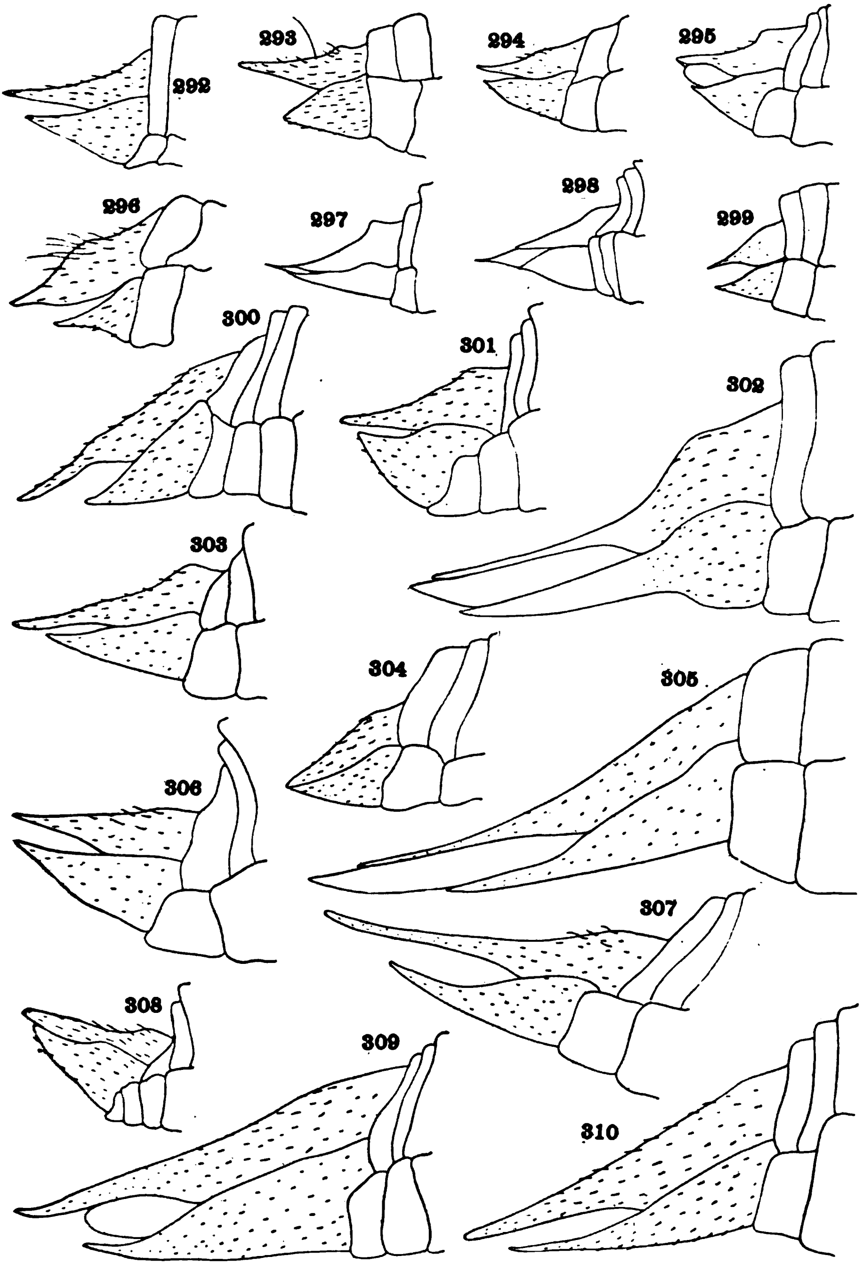
Lateral Aspect of the Male Cauda.

For explanation of plate see page 176.



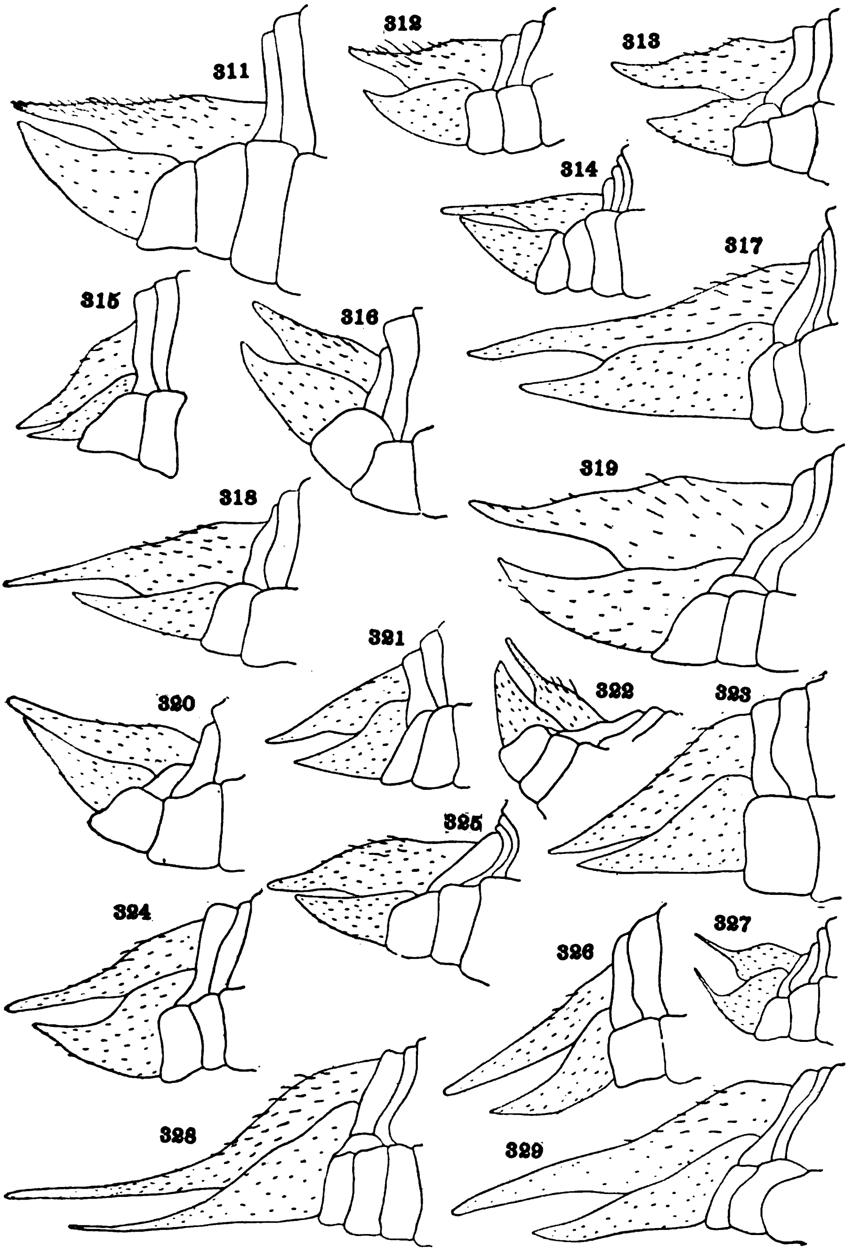
MALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 176 AND 177.



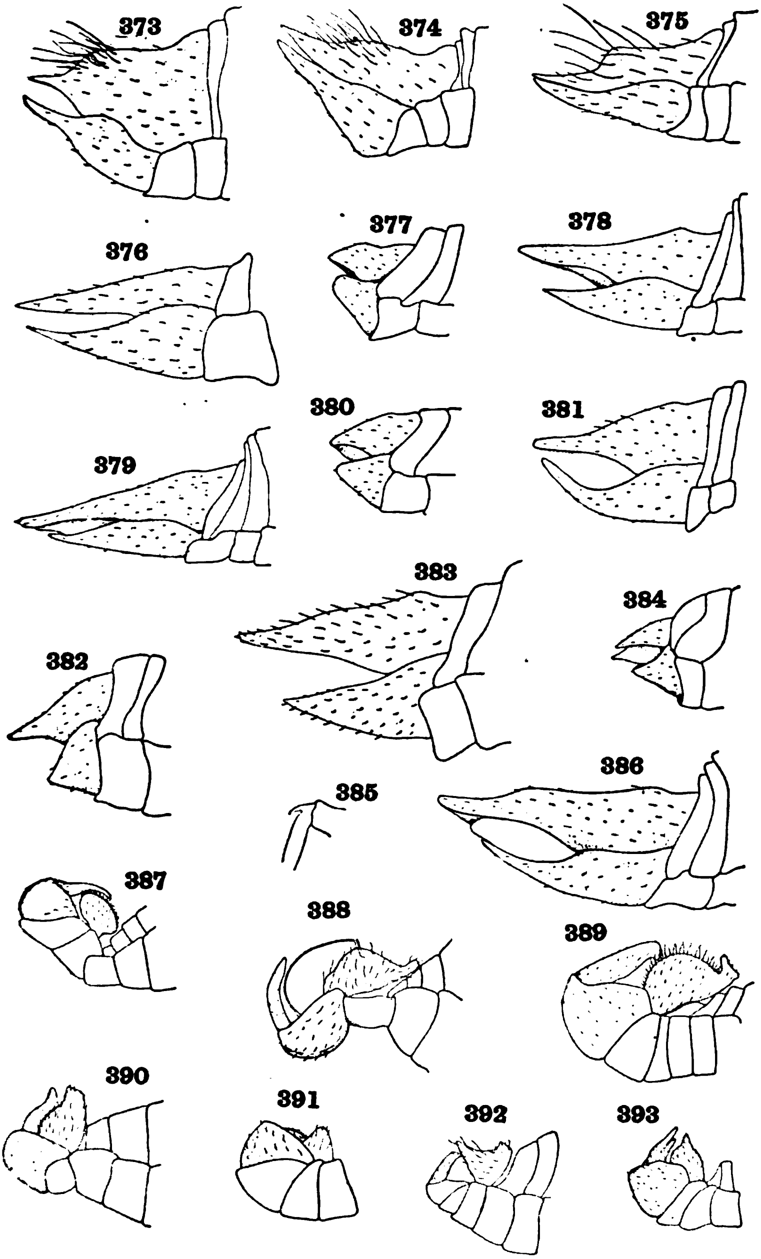
FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGES 177 AND 178.



FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 178.



MALE AND FEMALE CAUDA.

FOR EXPLANATION OF PLATE SEE PAGE 179.

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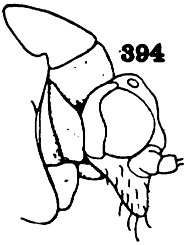

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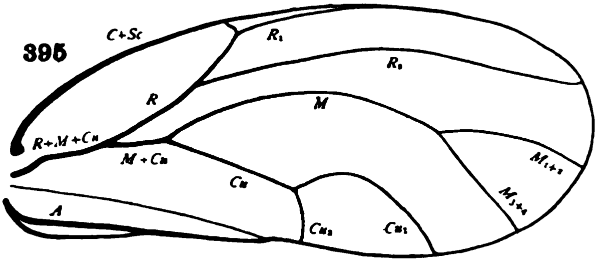

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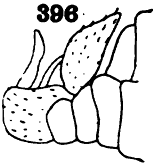

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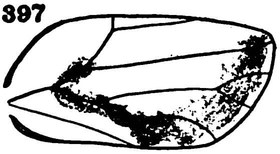

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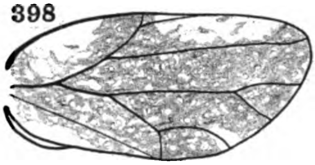

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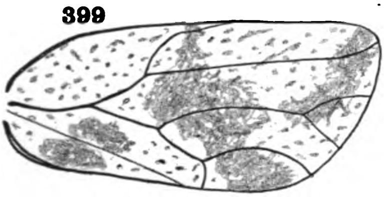

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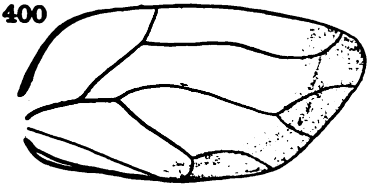

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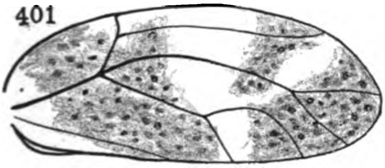

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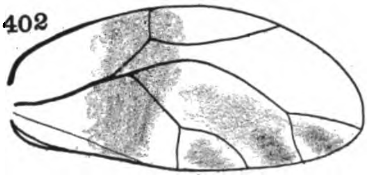

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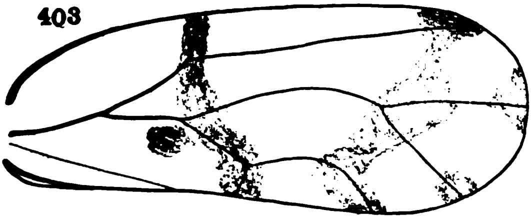

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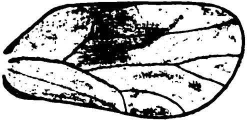

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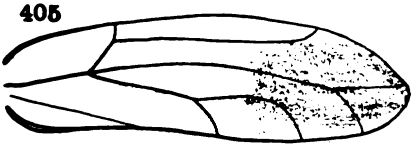

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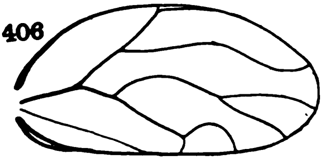
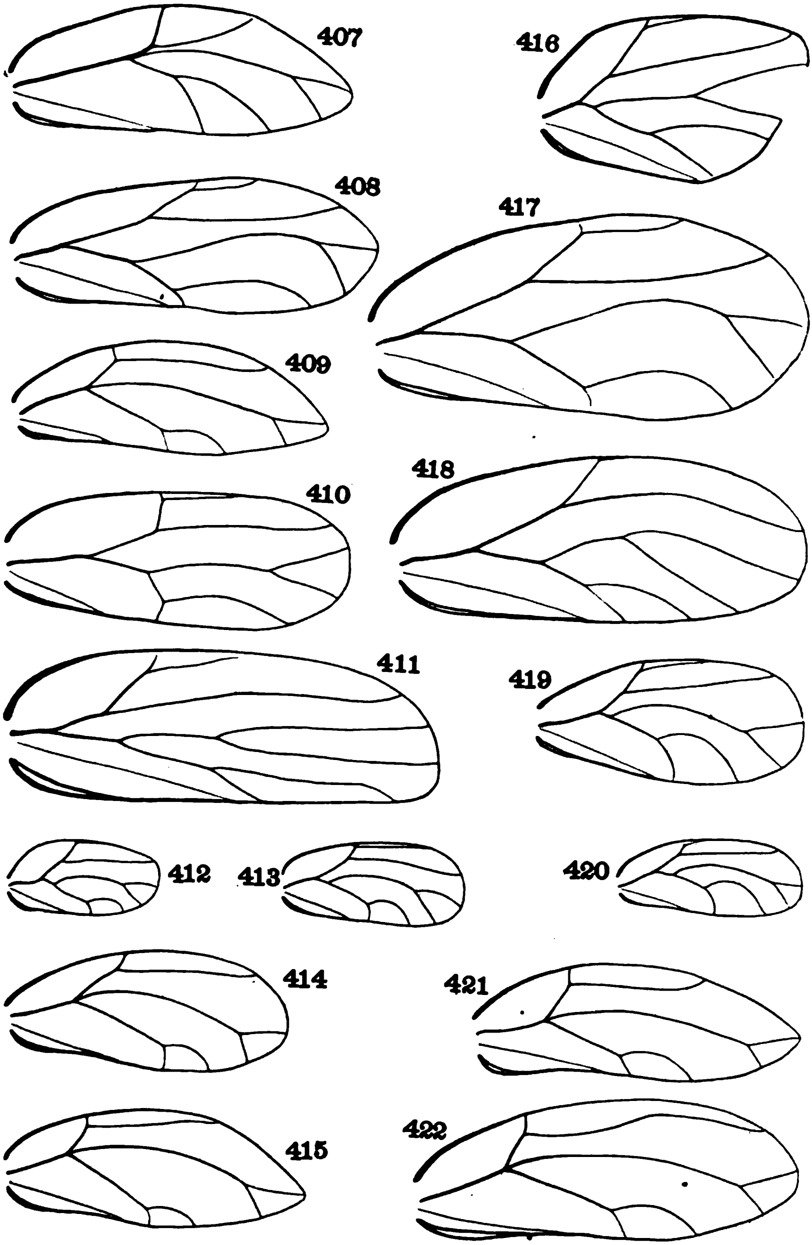


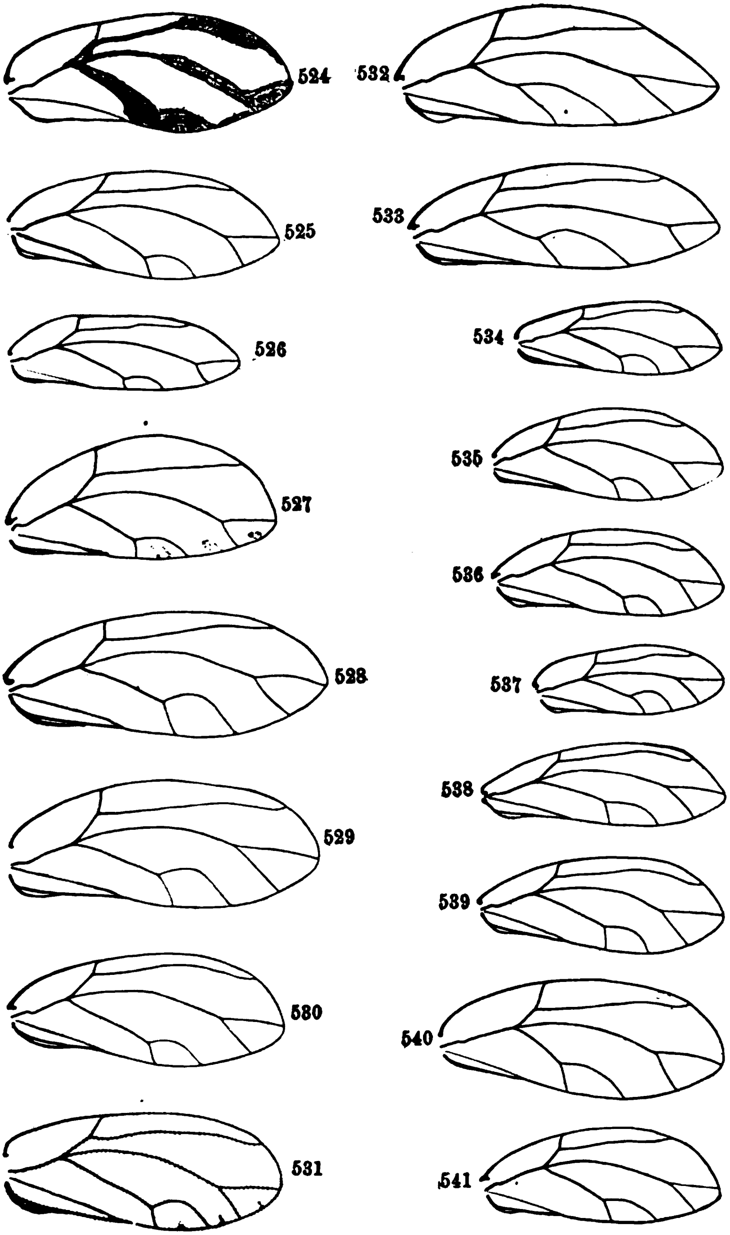
FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 179 AND 180.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATON OF PLATE SEE PAGE 180.



FOREWINGS OF PSYLLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 182.

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UNITED STATES NATIONAL MUSEUM

Bulletin 86

A MONOGRAPH OF THE GENUS CHORDEILES SWAINSON, TYPE OF A NEW FAMILY OF GOATSUCKERS

BY

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WASHINGTON
GOVERNMENT PRINTING OFFICE
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ADVERTISEMENT.

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Since 1902 a series of octavo volumes containing papers relating to the botanical collections of the Museum, and known as the *Contributions from the National Herbarium*, has been published as bulletins.

The present work forms No. 86 of the *Bulletin* series.

RICHARD RATHBUN,
Assistant Secretary, Smithsonian Institution,
In charge of the United States National Museum.

WASHINGTON, D. C., *March 12, 1914.*

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A MONOGRAPH OF THE GENUS CHORDEILES SWAINSON, TYPE OF A NEW FAMILY OF GOATSUCKERS.

By Harry C. Oberholser,
Of the Biological Survey, United States Department of Agriculture.

INTRODUCTION.

The present study of the Caprimulgine genus *Chordeiles* found its origin in the attempt to identify the nighthawks of Texas. It soon became evident that nothing short of a thorough revision of the two North American species, *Chordeiles virginianus* and *Chordeiles acutipennis*, would produce anything like satisfactory results. This was finally undertaken, partly at the instance of Mr. Robert Ridgway; and the only other species of the genus, *Chordeiles rupestris*, has been included for the sake of completeness. By reason of the complicated and almost infinite variations due to sex, age, individuals, and geographic areas, the present group is one of the most difficult of all North American birds; and its elucidation has involved the expenditure of an incredible amount of time and labor.

The material available consists altogether of 1,165 specimens, including the types of most of the valid forms (excepting *Chordeiles virginianus virginianus*, *Chordeiles virginianus aserriensis*, *Chordeiles virginianus minor*, *Chordeiles acutipennis acutipennis*, *Chordeiles acutipennis exilis*, and *Chordeiles rupestris rupestris*), and of one synonym, *Chordeiles gundlachii* Lawrence. These specimens are distributed among the three species as follows: *Chordeiles virginianus*, 780; *Chordeiles acutipennis*, 379; *Chordeiles rupestris*, 6.

This material has been derived from the following sources: The United States National Museum, including the Biological Survey collection; the American Museum of Natural History; the Academy of Natural Sciences of Philadelphia; the Museum of Comparative Zoölogy in Cambridge, Massachusetts, including the collection of Messrs. E. A. and O. Bangs; the Carnegie Museum of Pittsburgh, Pennsylvania; the Museum of Vertebrate Zoology in Berkeley, California; the Field Museum in Chicago, Illinois; the Victoria Memorial Museum in Ottawa, Ontario; and the private collections of Mr. Joseph Grinnell, Mr. F. Seymour Hersey, Dr. G. C. Rinker, Dr. L. B. Bishop, Mr. J. H. Fleming, and Mr. A. C. Bent. To the authorities of these institutions, to the curators of their bird collections, and also to the gentlemen above mentioned, the writer wishes here to express his thanks for their courtesies. Moreover, to Dr. Charles W. Richmond, of the United States National Museum, he is as usual indebted for many kindnesses in connection with the present investigation. The drawings of skulls on plates 1 and 2 were executed by Miss R. G. Collette.

For the names of colors Mr. Robert Ridgway's recently published Color Standards and Nomenclature[1] has been adopted as the standard.

The numbering of the primaries is from the outermost, since this is so much more convenient in descriptive ornithology, although, of course, indefensible from a morphological standpoint.

Detailed synonymy has been omitted under the forms of both *Chordeiles virginianus* and *Chordeiles acutipennis*, because such synonymy would be merely a duplication of that in Mr. Ridgway's Birds of North and Middle America, part 6,[2] which is soon to appear.

All measurements are in millimeters. The specimens used in the average measurements under each subspecies, and with which comparisons are made, are taken just as far as possible from typical specimens—that is, from examples best exhibiting the differential characters. In the tables of detailed measurements all the birds used in the diagnostic averages, as well as all other than adult birds, are indicated by reference marks. The various dimensions of which use is made in the following pages have been taken as follows:

Length of wing.—Measured in a straight line from the bend of the closed wing to the end of the longest primary, with the primaries in their natural position—that is, not straightened.

Length of tail.—Taken with dividers from the point of insertion of the middle rectrices to the tip of the longest.

Exposed culmen.—Measured in a straight line from the beginning of the feathers on the culmen to the tip of the maxilla—that is, the chord of the exposed culmen.

Length of tarsus.—A straight line from the center of the heel joint on the posterior side to the middle of the joint between the metatarsus and the middle toe on the anterior side.

Middle toe.—Measured along the upper side from the middle of the joint between the metatarsus and the middle toe to the base of the uncovered claw.

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[1] Ridgway, Color Standards and Color Nomenclature, 1912 (=January 16, 1913), pp. (1–4); i–iv; 1–44; frontispiece; pls. 1–53; Washington, D. C.

[2] Bull. U. S. Nat. Mus., No. 50, pt. 6, 1914. In this volume Mr. Ridgway has adopted from my manuscript my conclusions regarding the subspecies of *Chordeiles*; but he has not seen the introductory portion of the present bulletin, pages 1–23.

Genus CHORDEILES Swainson.

Chordeiles Swainson, Fauna Bor.-Amer., vol. 2, 1831 (1832), p. 496 (type, by original designation and monotypy, "*Chordeiles virginianus* [*Caprimulgus americanus*, Wils.]" qui *Caprimulgus virginianus*, Gmelin).

Chordeilus "Swains." Gray, List Genera Birds, 1840, p. 7 (type, by original designation and monotypy, *Caprimulgus virginianus*, Gmelin).

Microrhynchus Lesson, L'Echo du monde Savant, July 16, 1843, col. 109 (type, by monotypy, *Caprimulgus exilis* Lesson) (nec *Microrhynchus* Dejean [Megerle MS.], 1821, Coleoptera; Bell, 1835, Crustacea).

Chordiles "Swains. 1831" Tschudi, Untersuch. Fauna Peruana, Ornith., 1846, p. 21 (type, by monotypy, "*Ch. semitorquatus* Cab. MSS. [=] *Cap. pruinosus* Licht. Mus. Berol. vid. Tsch. Consp. av. Nro. 37," qui *Caprimulgus exilis* Lesson).

Chordediles Cabanis [Wiegmann's] Archv für Naturg., XIII, vol. 1, November, 1847, p. 346 (nom. emend. pro *Chordeiles* Swainson).

Ramphaoratus Bonaparte, Rivista Contemporanea, vol. 9, February, 1857, p. 215 (p. 9 of reprint), (type, by virtual monotypy, *Caprimulgus exilis* Lesson).

"*Chordedilus* 1861 Cab." Gray, Hand-list Gen. Spec. Birds, vol. 1, 1869, p. 61 (in synonymy).

Diagnosis.—Similar to *Nyctiprogne* Bonaparte, but bill stronger and broader basally; nostrils more rounded, more exposed, more tubular, and opening more obliquely, less laterally; tertials longer. Similar to *Nannochordeiles* Hartert,[1] but wing more pointed (less rounded), the third primary (counting from the outermost) much shorter than the first and second, instead of about the same length; tail more deeply emarginate.

Chars. gen.—Medium-sized, long-winged Chordeilidae; bill rather small and weak, decidedly hooked; nostrils rather large, strongly tubular, and opening obliquely; no long or conspicuous rictal bristles; no occipital, frontal, or nuchal crest; tail rather long, more than half (about 55–60 per cent) of wing, emarginate, the outer rectrices longest, all of moderate width, rounded or squarish at tips; wing long and pointed, the first or second primary (counting from the outermost) longest, the third shorter than either; tertials reaching nearly to the tip of sixth primary, or beyond; secondaries short, the shortest one not reaching the tips of primary coverts or not extending far beyond; feet rather weak; tarsus feathered in front for about the proximal third; tarsus usually shorter than middle toe without claw; outer toe slightly shorter than inner toe; exposed culmen about half the length of tarsus.[2]

Type.—*Caprimulgus virginianus* Gmelin (by original designation and monotypy).

---

[1] *Nannochordeiles* Hartert, Ibis, July, 1896, p. 374 (type, *Chordeiles pusillus* Gould).

[2] No osteological characters appear in this diagnosis, because proper comparative material of the most closely related genera is not available. Consult, however, pp. 6–9 of the present bulletin.

Geographical distribution.—Nearly all of South America, the West Indies, Central America, and North America excepting the far northern part.

Faunal distribution.—All or parts of the Patagonian, Brazilian, Subandean, Amazonian, Antillean, and Central American subregions of the Neotropical Region; the Sonoran and Boreal subregions of the Nearctic Region; but avoiding the barren grounds and alpine summits of the circumpolar Arctic Region.

Variance in generic characters.—No two of the three species at present composing this genus, *Chordeiles virginianus*, *Chordeiles acutipennis*, and *Chordeiles rupestris*, are exactly alike in structural characters, although they all agree with the generic diagnosis above given. In *Chordeiles virginianus*, type of the genus, the first (outermost) primary is usually longer than the second, occasionally about equal, but rarely shorter; the secondaries relatively short, the shortest usually not reaching the tips of the primary coverts by at least 5 millimeters, often much more; and the distance from the bend of the folded wing to end of shortest secondary generally less than from the latter point to the tip of fourth primary (counting from the outermost); outer pair of rectrices relatively narrow and their tips much rounded; maxillo-palatines relatively rather broad and somewhat triangular; anterior processes of the palatines relatively rather broad and strong; vomer very narrow; pterygoids with an antero-exterior angle which approaches the palatine; interorbital region very broad; and the ridges on median portion of frontals not strongly developed.

In *Chordeiles acutipennis*, however, the outermost (first) primary is usually shorter than the second, occasionally about equal or longer; secondaries longer than in *Chordeiles virginianus*, the shortest usually not falling short of the tips of the primary coverts by more than 3 millimeters, commonly longer or at least not shorter than the primary coverts; the distance from the bend of the folded wing to the end of the shortest secondary greater, usually decidedly so, than the distance from the latter point to the end of the fourth primary; outer pair of rectrices relatively broader than in *Chordeiles virginianus*, and their tips more truncate; maxillo-palatines relatively rather narrower and more elongated; anterior processes of the palatines more slender; vomer rather broader; pterygoids without a distinct antero-exterior angle; interorbital region somewhat narrower; and the ridges on median portion of frontal bones more conspicuous.

In *Chordeiles rupestris* the first (outermost) primary is longer than the second; the tertials are relatively longer than in *Chordeiles virginianus* and *Chordeiles acutipennis*, usually reaching or overreaching the tip of the sixth primary; the secondaries as in *Chordeiles acutipennis;* the tail-feathers as in *Chordeiles virginianus;* skull not examined.

It is thus apparent that *Chordeiles virginianus* and *Chordeiles acutipennis* differ in structural characters, which, were they trenchant and constant, instead of only average, would clearly warrant generic separation. But *Chordeiles rupestris* appears to be practically intermediate between these two species, or, to be more exact, partakes of the structural characters of both, though in pattern of coloration it is widely different from either. In the small series examined the characters of *Chordeiles rupestris*, as above given, are pretty constant, but in a larger series greater range of variation would doubtless be evident. The present case, therefore, might appear at first sight to be an ideal one for the profitable employment of subgenera; since if anything more than personal caprice is to determine what is to be considered a genus and what a subgenus, it is probably to be found in the principle of intergradation, a principle of general acceptance as applied to species and subspecies; by which a full genus would be a group trenchantly defined by structural characters, even though these differences be relatively slight; and a subgenus one the structural diagnostic characters of which intergrade through intermediate species with some other group, even if the extreme differences be relatively great. In the present case, however, we have a rather peculiar and unusual condition, for while there is more or less connection between the three species which would, by the above criterion, possibly form three subgenera, the intergradation is complicated by the fact that all the structural characters separating the species are, in *Chordeiles virginianus* and *Chordeiles acutipennis* at least, decidedly inconstant. To consider instable structural characters of this sort as the basis for subgeneric separation seems to the writer certainly undesirable.

These birds have, however, a decided interest for the student of evolution, because it is very evident that we have in these three species a case of genera in process of development. Unfortunately we have not sufficient osteological material to determine the amount of variation in cranial characters; but to show, as far as possible by actual figures, the constancy of the external structural characters separating *Chordeiles virginianus* and *Chordeiles acutipennis*, and thus to indicate the state of their relative evolutionary divergence, the writer examined a large number of specimens of each species and counted the individuals showing the different variations of the two most tangible characters, i. e., the comparative length of the outermost primary, and the relative length of the shortest secondary as compared with the primary coverts. A tabulation of these results is given herewith:

Characters.	*Chordeiles virginianus.*	*Chordeiles acutipennis.*
First primary:		
Longer than second	90 (85.7%)	12 (11.5%)
Equal to second	7 (6.6%)	11 (10.6%)
Shorter than second	5 (4.9%)	78 (75.0%)
Longer than second on one side but shorter on the other	3 (2.8%)	3 (2.9%)
Total number of birds examined	105	104
Shortest secondary:		
Longer than primary coverts	6 (5.3%)	92 (82.9%)
Equal to primary coverts	3 (2.8%)	8 (7.2%)
Shorter than primary coverts	103 (91.9%)	9 (8.1%)
Longer than primary coverts on one side but shorter on the other	0 (0.0%)	2 (1.8%)
Total number of birds examined	112	111

The above figures are based on so large a number of specimens that their percentage would probably not be materially changed by the examination of a greater number. From these percentages it will be seen that *Chordeiles virginianus* is more stable in its structural characters, at least in the two here considered, than is *Chordeiles acutipennis;* or, in other words, is farther along in its differentiation. Thus, in *Chordeiles virginianus* the first primary is *longer* than the second in 85.7 per cent of the specimens, while in *Chordeiles acutipennis* it is *shorter* than the second in only 75 per cent. Also in *Chordeiles virginianus* the shortest secondary is *shorter* than the primary coverts in 91.9 per cent; in *Chordeiles acutipennis* it is *longer* than the primary coverts in only 82.9 per cent. Further comparisons can easily be made from the table. Of the two characters here exploited, the length of the secondaries thus seems to be the better. There does not seem to be any difference in these structural characters among the different subspecies of either *Chordeiles virginianus* or *Chordeiles acutipennis;* and the above percentages of the two species include representatives of various subspecies indiscriminately.

Relationships.—The genus *Chordeiles* has always without question been placed in the family Caprimulgidae. A careful examination and comparison, however, of a series of skulls of *Chordeiles virginianus* and the skull of *Chordeiles acutipennis texensis*, with crania of *Antrostomus carolinensis*, *Setochalcis*[1] *vocifera*, *Phalaenoptilus nuttallii*, and *Nyctidromus albicollis merrilli*, and with Huxley's figure of the skull of *Caprimulgus europaeus*[2] (see pl. 1, fig. 1), reveal differences that make advisable, indeed even necessary, the removal of *Chordeiles* from the family Caprimulgidae. So far as cranial characters are concerned, *Chordeiles virginianus* (see pl. 1, fig. 2) and *Chordeiles acutipennis* are generically identical, since aside from some unimportant details, which are surely not of more than specific value, the skulls of these two species are the same. Both *Chordeiles virginianus* and *Chordeiles acutipennis* are perfectly *desmognathous*,[1] as the figure of the former[2] and the previously published figure of the latter[3] clearly show, which character alone in such a complete exemplification should be sufficient as a basis for recognition of a distinct family. In both species the maxillo-palatines meet on the median line and become ankylosed, at least in old birds, with each other and with the vomer. There is thus no doubt about their complete desmognathism. Besides this, however, *Chordeiles* differs from all the above-mentioned genera of Caprimulgidae in many other respects, as follows: Premaxillary (to cranio-facial suture) relatively as well as actually much shorter, only 37 per cent of the total length of the skull, whereas in *Setochalcis vocifera* it is 49 per cent; this, together with the actually as well as relatively much higher braincase, giving to the skull in general a curious humpbacked, pug-nosed appearance; interorbital portion of frontal region very much broader, medially depressed and furrowed, but laterally rising in a crest to the edge of the orbits, while in the other genera examined just the reverse is the case, the frontal region being rather inflated, with the orbital edges more or less rounded; vomer relatively narrow and slender; maxillo-palatines subtriangular instead of more or less strap-like or shoe-shaped; middle portion of palatines much broader, the lateral outline thus less constricted medially, more nearly straight, giving to the posterior portion a decidedly less flaring effect; antero-internal processes of palatines reaching to the maxillo-palatines; palatal opening between the halves of the premaxillary much smaller, narrower, and somewhat narrowly triangular instead of oval in shape; gall bladder absent;[4] rictal bristles wanting.

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[1] See p. 11.

[2] Proc. Zool. Soc. Lond., 1867, p. 453.

Unfortunately I have been unable to examine the skulls of the South American genera commonly referred to the Caprimulgidae, so that it is impossible to determine with exactness which of the above characters are to be regarded as supergeneric. Doubtless some of them will prove, upon examination of all the remaining groups, to be merely generic. The same lack of material renders doubtful the precise limits of the family group which includes *Chordeiles*. The nearest ally of *Chordeiles* is without much doubt *Nannochordeiles* Hartert, and this certainly belongs to the same family, while *Nyctiprogne* is probably also not distantly related. From external characters it would perhaps be better to include both *Lurocalis* and

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[1] The statement of Beddard (Structure and Classification of Birds, 1898, p. 239) that in *Chordeiles virginianus* the maxillo-palatines do not meet across the vomer is doubtless a slip or the result of examining an imperfect, abnormal, or immature skull, for in every one of the half dozen skulls we have examined these bones meet just as in *Chordeiles acutipennis*.

[2] See plate 1, fig. 2.

[3] Shufeldt, Proc. Zool. Soc. Lond., 1885, pl. 59, fig. 4.

[4] According to Beddard, Structure and Classification of Birds, 1898, p. 242.

Podager, though the latter is aberrant. The salient reliable differential characters of the two families here most concerned are in part well shown on plates 1 and 2, accompanying the present paper, and are also all given in the tabular exposition below:

Characters.	Caprimulgidae.	Chordeilidae.
Palate	Schizognathous [1]	Desmognathous.
Vomer	Broad	Narrow.
Maxillo-palatines	Strap-like, hook-like, or shoe-shaped	Subtriangular.
Palatines	Medially narrow, with lateral outline much constricted.	Medially broad, with lateral outline little constricted.
Antero-internal processes of palatines.	Widely separated from maxillo-palatines.	Reaching to maxillo-palatines.
Premaxillary	Long; 49 per cent of total length of skull.	Short; 37 per cent of total length of skull.
Braincase	Low	High.
Frontals	Medially convex	Medially concave.
Gall bladder	Present	Wanting.
Rictal bristles	Present [2]	Wanting.
Included genera	*Systellura* Ridgway	*Chordeiles* Swainson.
	Stenopsis Cassin	*Nannochordeiles* Hartert.
	Antiurus Ridgway	*Nyctiprogne* Bonaparte.
	Nyctipolus Ridgway	*Lurocalis* Cassin.[3]
	Setochalcis Oberholser [4]	*Podager* Wagler.[3]
	Setopagis Ridgway	
	Phalaenoptilus Ridgway	
	Nyctagreus Nelson	
	Otophanes Brewster	
	Nyctiphrynus Bonaparte [5]	
	Antrostomus Bonaparte	
	Nyctidromus Gould	
	Siphonorhis Sclater	
	Caprimulgus Linnæus	
	Eleothreptus Gray	
	Cosmetornis Gray	
	Macrodipteryx Swainson	
	Scotornis Swainson	
	Hydropsalis Wagler	
	Macropsalis Sclater	
	Lyncornis Gould [3]	
	Eurostopodus Gould [3]	

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[1] By some authors, as, for instance, Beddard and Parker, the Caprimulgidae are considered schizognathous, although by Huxley originally placed in the aegithognathous series. It is, of course, true that they are not typically schizognathous, having some aegithognathous characters; but it is also evident that, all things considered, they are much nearer the schizognathous than to the aegithognathous type.

[2] Except in the genera *Lyncornis* and *Eurostopodus*.

[3] Provisionally included.

[4] See p. 11.

[5] *Nyctiphrynus* Bonaparte (Rivista Contemporanea, vol. 9, February, 1857, p. 215 [p. 9 of reprint]) contained originally three species: *Caprimulgus ocellatus* Tschudi (type of *Ptilonycterus* Ridgway, 1912); *Caprimulgus nuttallii* Audubon (type of *Phalaenoptilus* Ridgway, 1880); and *Caprimulgus guianensis* Gmelin (= *Caprimulgus albicollis* Gmelin) (type of *Nyctidromus* Gould, 1838). The first species was thus last made type of a new genus; and this genus *Nyctiphrynus* was restricted by Gray (Hand-List Gen. and Spec. Birds, vol. 1, 1869, p. 59) to the same bird, *Caprimulgus ocellatus* Tschudi. I, therefore, now designate *Caprimulgus ocellatus* Tschudi as the type of *Nyctiphrynus* Bonaparte, and *Ptilonycterus* Ridgway consequently becomes its synonym.

The genera in the above lists are arranged in what seems to be their natural order, but manifestly the osteology of all must be studied before a finally satisfactory sequence can be devised. The Chordeilidae, by reason of their desmognathism and the loss of the gall bladder, seem to be a less ancient and less primitive group than the Caprimulgidae. The full and formal diagnosis[1] of the Chordeilidae, based, of course, almost entirely on *Chordeiles*, is as follows:

CHORDEILIDAE, new family.

Caprimulgi with sternum one-notched on each side; carotids two; syrinx tracheo-bronchial; oil gland present; cæca present; cervical vertebræ 13; fourth (outer) toe with but four phalanges; claw of middle toe pectinated; muscular formula AXY; biceps slip present; *expansor secondariorum* absent; *glutaeus primus* extending over biceps; gall bladder lacking; powder downs absent; skull broad, the zygoma spreading and distinctly angular, the interorbital breadth great; braincase high; frontals medially concave; premaxillary short, only 37 per cent of total length of skull; palate perfectly desmognathous; maxillo-palatines relatively broad and subtriangular, ankylosed with each other and with the vomer; palatines much inflated posteriorly and across their middle portion, not meeting except at their hind ends, the foramina in their middle portion small, their lateral outines little constricted medially, their antero-external processes long and slender, their antero-internal processes reaching to the maxillo-palatines; vomer long, slender, and pointed at its anterior end; basipterygoid processes well developed; rictal bristles wanting.

The type genus of this family is *Chordeiles* Swainson.

The geographical range of the family is as follows: South America, Central America, North America, and the West Indies; thus practically all of the Neotropical and Nearctic zoogeographical regions.

The genera to be included in the family Chordeilidae have already been discussed.[2]

In making comparisons of the skulls of *Chordeiles* with those of several genera of true Caprimulgidae some interesting facts concerning the latter family were discovered. The current genus *Antrostomus* Bonaparte, by many authors considered to include a well-known group of American species, by others united with *Caprimulgus*, is not only perfectly distinct from the latter, but is itself divisible into two very divergent groups. In the following comparisons the skulls of only three species, *Caprimulgus europaeus*, *Antrostomus*

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[1] Characters common to all Caprimulgi are omitted.

[2] See p. 8.

carolinensis, and "*Antrostomus*" *vociferus*, have been used, but skins of a considerable number of other American and Old World species have been examined. All comparisons with *Caprimulgus*, however, are entirely with *Caprimulgus europaeus* (see pl. 1, fig. 1), the type of *Caprimulgus* Linnæus,[1] for it is plain that the genus *Caprimulgus*, even restricted to Old World species, is a very heterogeneous group, and much in need of careful revision, for which the writer has at present neither time nor adequate available material.

In the first place, *Antrostomus carolinensis* (see pl. 2, fig. 1), the type by subsequent designation[2] of the genus *Antrostomus* Bonaparte,[3] and apparently the only member of this group as I now restrict it, differs greatly from *Caprimulgus* in both cranial and external characters, and is really more closely related to *Nyctidromus* than to either *Caprimulgus* or *Setochalcis*.[4] Its diagnosis is as follows:

Genus ANTROSTOMUS Bonaparte.

Similar to *Caprimulgus* Linnæus, but interorbital region of frontals narrower; palatines of very different shape, the distance from their posterior border to the posterior ends of the foramina in their middle portion much greater, nearly double, and these openings much smaller; the inflated posterior parts of the palatines themselves produced on each side considerably farther back than at the median line, thus more drawn to a point, and the postero-external outline of palatines laterally much less convex, in fact almost straight; vomer broader, and pointed, instead of bluntly rounded, at its anterior end; maxillo-palatines longer and relatively narrower, more strap-shaped, less shoe-shaped or hook-like; the palatal opening between the halves of the premaxillary smaller and more regularly oval; rictal bristles with long and conspicuous lateral filaments; tail more rounded; and pterylosis different.[5]

All the other American goatsuckers commonly referred to the genus *Antrostomus*, excluding those recently removed to other genera by Mr. Robert Ridgway,[6] agree, so far as I have been able to examine them, very closely in external generic characters, but I have seen the skull of only "*Antrostomus*" *vociferus*, from which I have drawn the cranial characters for this group. Since there are external generic differences distinguishing all these species from both *Caprimulgus* and *Antrostomus* (*carolinensis*), and likewise so many and such excellent cranial characters in "*Antrostomus*" *vociferus* (see pl. 2, fig. 2), it seems necessary to separate all these American species under the name—

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[1] *Caprimulgus* Linnæus, Syst. Nat., ed. 10, vol. 1, 1758, p. 193 (type, by tautonymy, *Caprimulgus europaeus* Linnæus).

[2] Gray, List Gen. Birds, 1840, p. 7.

[3] Bonaparte, Geog. and Comp. List Birds Europe and North Amer., 1838, p. 8.

[4] See p. 11.

[5] See Clark, Auk, vol. 18, 1901, pp. 168–169.

[6] Ridgway, Proc. Biol. Soc. Wash., vol. 25, May 4, 1912, pp. 98–99.

SETOCHALCIS,[1] new genus.

Somewhat resembling *Antrostomus* Bonaparte (as restricted above), but interorbital region of frontals much wider; palatines with inflated posterior portion smaller, the postero-external angles more sharply pointed and little if any extended backward beyond the median part of the palatines; vomer somewhat more sharply pointed; maxillo-palatines smaller, shorter, less sharply pointed and much more widely separated; the oval palatal opening between the halves of the premaxillary more elongate; pterygoids not so far separated from the basisphenoid, resting almost against it for the anterior half of their length; rictal bristles without lateral filaments; second primary (counting from the outermost) longest, the third but little shorter, the first considerably shorter than the third and about equal to the fourth (in *Antrostomus* the second primary is the longest, but the third is decidedly shorter, the first still a little shorter, but very much longer than the fourth); three primaries sinuate on their outer webs, instead of two as in *Antrostomus;* wing relatively shorter; and pterylosis different.[2]

Superficially similar to *Caprimulgus* Linnæus, but palatines very differently shaped, the distance from their posterior border to the posterior ends of the foramina in their middle portion much greater, and these openings much smaller; the postero-external angles of palatines much more sharply pointed, and the postero-external outline laterally much less convex, indeed nearly straight; vomer broader, and pointed, instead of bluntly rounded, at its anterior end; maxillo-palatines more oval or strap-like, not so shoe-shaped or hook-like, and much more widely separated; the palatal opening between the halves of the premaxillary smaller, narrower, more oval (less ovate); pterygoids not so far separated from the basisphenoid, but resting almost against it for the anterior half of their length; second primary (counting from the outermost) longest, the third only a little less, the first considerably shorter than the third and about equal to the fourth (in *Caprimulgus*[3] the second primary is also the longest, but the third is decidedly shorter, the first still a little shorter or equal, but very much longer than the fourth); three primaries sinuate on their outer webs, instead of two as in *Caprimulgus;* tail more rounded; wing relatively shorter.

The type of this genus is *Caprimulgus vociferus* Wilson.

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[1] *Σής, σητός*, tinea; *χαλκίς*, avis nocturna.

[2] See Clark, Auk, vol. 18, 1901, pp. 168–169.

[3] It should be remembered that all these comparisons with *Caprimulgus* refer to *Caprimulgus europaeus* only. See p. 10.

Its geographical range is as follows: South America, Central America, the West Indies, and North America excepting the northern and central western portions.

The species and subspecies at present referred to this genus, of most of which the writer has examined skins, are as follows:

Setochalcis sericocaudata (Cassin.)[1]
Setochalcis rufa rufa (Boddaert).
Setochalcis rufa otiosa (Bangs).
Setochalcis saturata (Salvin).
Setochalcis badia (Bangs and Peck).[2]
Setochalcis salvini (Hartert).[3]
Setochalcis cubanensis (Lawrence).
Setochalcis vocifera vocifera (Wilson).
Setochalcis vocifera arizonae (Brewster).[4]
Setochalcis vocifera macromystax (Wagler).[5]
Setochalcis vocifera oaxacae (Nelson).[6]
Setochalcis vocifera chiapensis (Nelson).
Setochalcis ridgwayi ridgwayi (Nelson).
Setochalcis ridgwayi goldmani (Nelson).[7]

Phylogeny.—The genus *Chordeiles*, like the American branch of the family Caprimulgidae, is of South American origin. This is evident from the facts that two of its three species, *Chordeiles acutipennis* and *Chordeiles rupestris*, are still permanently resident there; that the forms of *Chordeiles acutipennis* which live in Central America and Mexico are more or less migratory; and, futhermore, that *Chordeiles virginianus*, the remaining species, though at present entirely West Indian and North American in its distribution during the breeding season, returns entirely to South America to pass the winter.

It seems probable that the present genus with its two nearest generic allies, *Nannochordeiles* and *Nyctiprogne*, had a common immediate ancestor; though, perhaps, *Nannochordeiles*, which is really a small, somewhat modified *Chordeiles*, is a more direct offspring of the latter group.

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[1] This is the original spelling of the specific name.

[2] This is apparently the same as the subsequent *Antrostomus nelsoni* Ridgway (Proc. Biol. Soc. Wash., vol. 25, May 4, 1912, p. 90).

[3] This is the same as *Antrostomus notabilis* Nelson, of later date.

[4] This is a perfectly good race, differing from *Setochalcis vocifera macromystax* of the eastern, central, and south central parts of Mexico, from southern Coahuila to Guerrero, in lighter and more brownish coloration both above and below. It was originally described by Mr. William Brewster as *Antrostomus vociferus arizonae* (Bull. Nuttall Orn. Club, vol. 6, 1881, p. 69) from the Chiricahua Mountains in southern Arizona. It ranges north to southern Arizona and central western Texas; west to Arizona; south to Jalisco, Mexico; east to Durango, Mexico, aud central western Texas.

[5] This is *Caprimulgus macromystax* Wagler (Isis, 1831, col. 588), which has no more specific locality than "Mexico." Since, in view of the several subspecific forms since described, it is desirable to have a more definite type-locality, we designate as such Mount Orizaba, Puebla, Mexico.

[6] Still known from only the type specimen, a female, and if distinct from *Setochalcis vocifera macromystax* Wagler, is certainly but a subspecies of *Setochalcis vocifera*.

[7] Clearly not more than subspecifically different from *Setochalcis ridgwayi*.

The real relationship and therefore the origin of the three species of *Chordeiles* is a problem of some difficulty. It seems probable, however, that *Chordeiles virginianus*, to have become, in structure, pattern of coloration, and color so well differentiated specifically from both *Chordeiles acutipennis* and *Chordeiles rupestris;* to have established itself entirely outside of South America; to have spread over and permanently occupied as a summer home so large an area; and to have become modified into so many geographic races, notwithstanding the very brief period in each year during which the modifying influences could be operative, must be a relatively ancient species. On the other hand, *Chordeiles acutipennis*, less stable than *Chordeiles virginianus* in structural characters, less dispersed into territory where it is migratory, modified into fewer subspecific forms, and these less strongly differentiated from the parent stock, and still largely resident in South America, seems to be of more recent origin. But *Chordeiles rupestris*, which is very different from *Chordeiles acutipennis* in pattern of coloration and in structure, and which occupies approximately the same area in South America, probably, therefore, developed simultaneously from the same ancestor. Furthermore, the close superficial resemblance in color and markings which *Chordeiles acutipennis acutipennis* from northern South America bears to *Chordeiles virginianus minor* from Jamaica and Cuba is at least suggestive, if not significant. Thus we naturally arrive at the hypothesis that all three species of *Chordeiles* were derived from a common ancestor, probably resembling *Chordeiles virginianus* in structure and *Chordeiles acutipennis* in coloration, but now extinct, from which *Chordeiles virginianus* first became differentiated, and afterwards both *Chordeiles acutipennis* and *Chordeiles rupestris*, the latter so greatly specialized, as it is now seen to be in color pattern, by some unknown agency, possibly individual variation and subsequent fortuitous, temporary segregation. The only region where the two species, *Chordeiles virginianus* and *Chordeiles acutipennis*, occupy a common breeding area is in the southwestern United States and extreme northern Mexico. Here the former seems to have immigrated first, and from the north and east; while afterwards *Chordeiles acutipennis*, then a perfectly distinct species, extended its range northward from southern Mexico until it overlapped that of *Chordeiles virginianus*, and it seems to be still pushing northward.

Sequence of forms.—An ideal linear sequence of species and subspecies, which shall show their proper phylogenetic relationship, is, however, desirable, probably out of the question in a complicated group like the genus *Chordeiles*. As some such arrangement is, of course, necessary for the sake of convenience, and as it is more satisfactory for a list or technical treatise to begin the catalogue of subspecies under each species with the "typical," or rather the first-described race, the name of which the species as a whole bears, the writer has tried to arrange the subspecific forms in as natural an order as is possible under these circumstances, and this sequence he has followed in the detailed treatment of the forms of the genus.

A linear arrangement more satisfactory from the standpoint of relationship may, of course, be obtained by disregarding the purely arbitrary placing of the first-described form of a species at the head of the list of subspecies. Such a list, with due regard for the phylogeny and present-day affinities of both species and subspecies, and one which seems to the writer to express, as eloquently as a mere list can, their known or assumed relationships, is as follows:

Chordeiles virginianus minor.
Chordeiles virginianus vicinus.
Chordeiles virginianus chapmani.
Chordeiles virginianus aserriensis.
Chordeiles virginianus virginianus.
Chordeiles virginianus hesperis.
Chordeiles virginianus sennetti.
Chordeiles virginianus howelli.
Chordeiles virginianus henryi.
Chordeiles acutipennis acutipennis.
Chordeiles acutipennis exilis.
Chordeiles acutipennis micromeris.
Chordeiles acutipennis texensis.
Chordeiles acutipennis inferior.
Chordeiles rupestris rupestris.
Chordeiles rupestris xyostictus.
Chordeiles rupestris zaleucus.

The necessity of beginning in each species with the oldest or lowest form brings into juxtaposition, in a linear arrangement, the lowest or oldest form of any one species with the highest or most recent form of the preceding species, but there seems to be no better way. In the above list this is most noticeable with regard to *Chordeiles virginianus* and *Chordeiles acutipennis*, for, of the races of the former, *Chordeiles virginianus minor* is undoubtedly the one most closely allied to *Chordeiles acutipennis acutipennis*, though of necessity placed farthest from it serially.

The sequence of subspecies under each species is also difficult to express in a single linear list, owing to the fact that some races are about equally related to two or three others. Thus in the case of

Chordeiles virginianus the subspecies are properly placed in their phylogenetic order as far as the fourth, for *Chordeiles virginianus aserriensis* is surely a pale form derived from *Chordeiles virginianus chapmani.* But *Chordeiles virginianus virginianus* is without doubt also an offshoot from *Chordeiles virginianus chapmani*, and subspecifically not very closely allied to *Chordeiles virginianus aserriensis.* The rest follow in their presumed natural order.

In *Chordeiles acutipennis* a practically natural order is possible, the only races which require comment in this connection being *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis.* Were the linear sequence to be strictly geographical, that of the first three races of *Chordeiles acutipennis* would be *Chordeiles a. exilis*,[1] *Chordeiles a. acutipennis*, *Chordeiles a. micromeris;* for the first is geographically isolated from the Central American form not only by a hiatus in the breeding range but by the interpolation of *Chordeiles acutipennis acutipennis.* This race, *Chordeiles acutipennis exilis*,[1] is, however, in some characters a departure from *Chordeiles acutipennis acutipennis* in the direction of *Chordeiles acutipennis micromeris*, though not exactly intermediate, and is probably the result of environmental conditions somewhat similar to those of the last-mentioned form.

In the case of *Chordeiles rupestris*, the material is so limited that only a suggestive opinion is possible. If all the characters of *Chordeiles rupestris xyostictus*[2] and *Chordeiles rupestris zaleucus*,[3] particularly of the latter, prove constant in a larger series, the former is probably the one most closely allied to *Chordeiles rupestris rupestris*, since it differs only in colors, whereas *Chordeiles rupestris zaleucus* differs also in pattern of coloration.

Species and subspecies.—There seem to be only three specific types referable to the genus *Chordeiles*, namely, *virginianus*, *acutipennis*, and *rupestris;* but these are so trenchantly different from each other both structurally and in pattern of coloration that there can be no question of their entire distinctness. All the other forms are clearly subspecies. The 17 forms here recognized are distributed as follows: *Chordeiles virginianus*, with 9 races; *Chordeiles acutipennis*, with 5; and *Chordeiles rupestris*, with 3. For convenience of reference a list of all these, with their type localities, is added here:

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[1] See p. 98.

[2] See p. 116.

[3] See p. 118.

Name.	Type-locality.
Chordeiles virginianus virginianus	Eastern Virginia.
Chordeiles virginianus hesperis	Bear Lake, San Bernardino Mountains, southern California.
Chordeiles virginianus sennetti	50 miles west of the Pembina Mountains, central northern North Dakota.
Chordeiles virginianus howelli [1]	Lipscomb, northwestern Texas.
Chordeiles virginianus henryi	Fort Webster, southern New Mexico.
Chordeiles virginianus aserriensis [2]	Valley of Aserri River, near San José, Costa Rica.
Chordeiles virginianus chapmani	Gainesville, northern Florida.
Chordeiles virginianus vicinus	Long Island, Bahama Islands.
Chordeiles virginianus minor	Northern coast of Cuba.
Chordeiles acutipennis acutipennis	Cayenne, French Guiana.
Chordeiles acutipennis exilis [3]	Northern Chile.
Chordeiles acutipennis micromeris [4]	Xbac, northern Yucatan, Mexico.
Chordeiles acutipennis texensis	Ringgold Barracks, near Rio Grande City, southern Texas.
Chordeiles acutipennis inferior [5]	Triunfo, southern Lower California, Mexico.
Chordeiles rupestris rupestris	Rocky islands of the Rio Negro, northern Brazil.
Chordeiles rupestris xyostictus [6]	Bogota, Colombia.
Chordeiles rupestris zaleucus [7]	Pebas, northern Peru.

[1] New subspecies; see p. 57.
[2] See p. 71.
[3] See p. 98.
[4] New subspecies; see p. 100.
[5] New subspecies; see p. 109.
[6] New subspecies; see p. 116.
[7] New subspecies; see p. 118.

Recognition of subspecies.—All but two of the forms here treated as subspecies are found to intergrade with some one or even several other forms, either by gradual mergence across an intermediate geographic area, or if isolated on islands or elsewhere, then by individual variation, and in the first case not infrequently both geographically and individually, so that each species is made up of a complete chain of connected races. The two exceptions mentioned are *Chordeiles rupestris xyostictus*[8] and *Chordeiles rupestris zaleucus*,[9] both being little-known birds of probably limited distribution, the characters of which are such as reasonably presuppose their subspecific, rather than specific, relationship, for which reason we have here assigned them such a rank.

The problem of the number of subspecies to be recognized is, as in the case of similar wide ranging and plastic animals, a somewhat difficult one, particularly in *Chordeiles virginianus* and *Chordeiles acutipennis*. The great individual variation seriously complicates the situation, for however few may be the subspecific divisions of particularly these two species, such subspecies will more or less overlap those of one or more others, hence the characters can in no case be more than average. There are, notwithstanding this excessive and troublesome individual variation, well-marked geographic differences which, upon examination of proper series, are apparent at a glance; and there are also other geographic variations, not very evident, except by careful study, and which may or may not have special significance according to the attitude of the investigator. The nominal designation of these small and apparently more or less ephemeral differences may, it seems to me, properly be left until future time and study shall make such a course advantageous. For the present purpose, therefore, the writer has contented himself with recognizing in nomenclature such differences of size, pattern, and color as appear to maintain during the breeding season a fair average differentiation and uniformity over an isolated or reasonably different or extensive geographic area. The results, while they thus bring into evidence probably all the significant geographic variations of the several species, at least in so far as the available material warrants, are at the same time not excessive subdivision. Fewer subspecies would obscure interesting geographic variations, with little or no gain in the ease of identification of given specimens; more would seem, from the outlook of our present material, superfluous and inadvisable.

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[8] See p. 116.
[9] See p. 118.

Identification of specimens.—The naming of subspecies is most important in that it brings into prominence the facts of geographic distribution and evolution and provides convenient handles for their use. In the case of migratory birds it furnishes a means, often of great value, sometimes indispensable, of tracing their wanderings.

Given any certain number of races, therefore, of a *Chordeiles* or species of any other genus, with a mass of undetermined material, it naturally follows that proper identification must precede any use of the facts which such material exhibits. This, however, in difficult groups, like *Chordeiles*, is often a matter of considerable difficulty, and for satisfactory results requires a good series of authentic specimens for comparison, coupled with a thorough knowledge of differential characters and variations. In the present genus, so great and so complicated is the variation of individuals, sex, and age, that it is absolutely necessary to make comparisons with specimens of the same sex and age and with typical series. On this account very full comparisons are, in the following pages, made under the head of each subspecies. As is always the case with subspecies, the differences separating which are only average, there are specimens in nearly all the races of *Chordeiles*, which individually are not separable from certain individuals of some other race. With breeding birds of this kind identification is in most cases comparatively easy, for if their respective localities are within the known range of any subspecies they are, of course, identifiable as individual variants of such subspecies. But birds from intermediate areas require more careful examination, and often a series from a locality is necessary for their proper allocation. Since, however, the certain breeding period of *Chordeiles* is comparatively so short, most of the specimens collected are either migrants or not surely breeding birds, and their subspecific determination becomes often a matter of great difficulty, and sometimes of more or less uncertainty as well.

For obvious reasons an attempt has been made to name every specimen handled in the present investigation, and the results are contained in the lists of specimens under each subspecies. With such a large proportion of specimens of unknown breeding origin, in a group which presents so many puzzling and overlapping variations as do the subspecies of *Chordeiles virginianus* and *Chordeiles acutipennis*, it is too much to hope that I have correctly placed every single individual of the large number that I have examined; but I have carefully scrutinized and compared every one, so that the final determination as printed represents, in each individual case, the best opinion I can offer with the means at my present disposal. Some doubtful specimens have been identified and reidentified during the progress of the work as many as six or eight times, not always, it must be admitted, with the same result! In instances such as those mentioned above, where a given variant specimen can be matched by individuals belonging to two or even more races, the specimen has been assigned to that form by the average subspecific characters of which it is most closely approached; and, in determining this, both the average of single characters among individuals of the same form, and an average of all the differential characters of the given subspecies are taken into consideration. This seems to be the only logical way to treat such cases, and by it we probably much more closely approximate the truth than by any other method.

Variation.—The species of this genus have a wide range of all kinds of variation excepting seasonal, which is at a minimum, due partly to the comparatively little abrasion to which the plumage is subject; partly to the great similarity of freshly molted birds to those in worn plumage, for there are, on the fresh feathers, no differently colored tips or edges to wear off; and partly, in the case of a semiannual molt, to the sameness of successive adult plumages.

Individual variation is often so great as seriously to complicate the problem of geographic forms, as well as to render difficult the identification of specimens. Furthermore it is just as great in the sedentary as in the migrant forms. This is, however, fully treated under the various species and subspecies.

Sexual differences are about equally great in all the species. In *Chordeiles acutipennis* and *Chordeiles virginianus* they are of very similar kind, and are mostly differences of color; while in *Chordeiles rupestris* they consist more in the pattern of coloration.

The variation due to age is likewise about the same in *Chordeiles virginianus* and *Chordeiles acutipennis*, and is so great that there is no difficulty at all in distinguishing immature from adult birds. The immature plumages of *Chordeiles rupestris* appear to be unknown, but their relative differences are probably much the same as those of the other species of the genus.

Geographic variation is not so great as in many other birds of even less but otherwise similar geographic range but of greater plasticity. This variation has been kept down in part, doubtless, by the extensive migration of the northern forms; but it probably can not be fully accounted for in such a way, since the species least or not at all migratory, *Chordeiles acutipennis* and *Chordeiles rupestris*, are seen to be, if anything, less variable than the highly migratory *Chordeiles virginianus*. Apparently such a condition of limited geographic variation is induced also by the excessive individual variation in species of this genus; by their inherent smaller degree of plasticity; as well as by the phylogenetic age of the species, as compared with those of other genera. The last may also be a determining factor in the species of *Chordeiles*, as compared with each other; and if *Chordeiles acutipennis* and *Chordeiles rupestris* are of more recent evolution than *Chordeiles virginianus*, as seems probable, this may be, in geographic variation, an offset to their more sedentary habits.

General habits.—The nighthawks of this genus are birds of the open country. Being strong of wing, they are of easy though powerful flight, and spend much time in the air, where they obtain most of their insect food, which their great mouths admirably fit them to scoop in while on the wing. Their feet are weak, and not well adapted to perching in the ordinary way; so the birds rarely alight high up in trees, but crouch on the ground or other flat surface, on posts, fence-rails, rocks, prostrate trees, or low branches; and, when on a branch, log or fence-rail, sit almost invariably lengthwise of the perch.

These nighthawks build no nest, but deposit their two well-mottled eggs on the ground or similar places. The young are practically helpless for some time after birth.

Unfortunately these birds furnish a good mark for the hunter, and often on this account fall to the gun of the sportsman or pot-hunter. They deserve a much better fate, for they are beneficial birds, living almost entirely, if not exclusively, on insects.

History.—The earliest account of any species of this genus is by Catesby,[1] who in 1743 described *Chordeiles virginianus* as the

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[1] Nat. Hist. Carolina, Florida, and Bahama Islands, vol. 2, Appendix, 1743, p. 16, pl. 16.

"Whippoorwill, *Caprimulgus minor Americanus.*" The South American *Chordeiles acutipennis* was first brought to notice by Buffon,[1] who gave, under the name "L'Engoulevent acutipenne de la Guyane," a description and a brief note on its habits. Both these species, when subsequently given a binomal name, were referred to the genus *Caprimulgus* Linnæus, as was also a third species described later by Spix[2] as *Caprimulgus rupestris.* Swainson was the first author to recognize their structural differences from *Caprimulgus*, and first separated the nighthawks generically as *Chordeiles.*[3] Another species, described as *Chordeiles pusillus*,[4] has since been made the type of a new genus *Nannochordeiles* by Dr. E. Hartert.[5] Further species which have been at one time or another by some authors referred to *Chordeiles*, but which all belong in other genera, are *Siphonorhis americanus*, *Nyctiprogne leucopyga*, *Nytipolus hirundinaceus*,[6] *Lurocalis semitorquatus*, *Lurocalis nattereri*, and *Nyctibius leucopterus.*

Nomenclature.—Swainson's name for this generic group, *Chordeiles*, first proposed by him in 1832,[7] is by several years the earliest appellation, and is of undoubted application, since it is monotypic, and has for its type by original designation "*Chordeiles virginianus* (*Caprimulgus americanus* Wils.)," which is, of course, none other than *Caprimulgus virginianus* Gmelin. A subsequent generic name is *Microrhynchus* Lesson,[8] type by monotypy, *Caprimulgus exilis* Lesson; but besides being 11 years antedated by *Chordeiles* Swainson is, furthermore, untenable under any circumstances by reason of *Microrhynchus* Dejean,[9] a genus of Coleoptera, and *Microrhynchus* Bell,[10] a genus of Crustacea. In 1857 Bonaparte, either unaware of *Microrhynchus* Lesson, or considering it unusable, proposed *Ramphaoratus*[11] in the following fashion:

9. Ramphaoratus, *Bp.*
35. truncatus, *Bp. Mus. Br.*
(*caberculatus*? Jardin.
36. exilis, *Less.*
pruinosus, Tschudi).

From this it is evident that he intended to include two species: the first an undescribed form to be based on specimens in the British Museum, and which he regards as probably or possibly identical with

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[1] Hist. Nat. des Oiseaux, orig. ed., vol. 1779, pp. 547–548.
[2] Avium Spec. Nov. Bras., vol. 2, 1825, p. 2, pl. 2.
[3] Fauna Bor.-Amer., vol. 2, 1831 (1832), p. 496.
[4] Gould, Proc. Zool. Soc. Lond., 1861, p. 182.
[5] Ibis, July, 1896, p. 374.
[6] See p. 97.
[7] Fauna Bor.-Amer., vol. 2, 1831 (1832), p. 496.
[8] L'Echo du Monde Savant, July 16, 1843, col. 109.
[9] Catalogue des Coleoptères, 1821, p. 98 (Megerle MS.).
[10] Proc. Zool. Soc. Lond., 1835, p. 88.
[11] Rivista Contemporanea, vol. 9, February, 1857, p. 215 (p. 9 of reprint).

"*caberculatus*" Jardine, this undoubtedly a misprint for [*Caprimulgus*] *labeculatus* Jardine, a synonym of *Chordeiles acutipennis;* and the second species, *Caprimulgus exilis* Lesson, with which he synonymizes *Caprimulgus pruinosus* Tschudi. Since the *Ramphaoratus truncatus* of Bonaparte is a *nomen nudum*, it leaves *Caprimulgus exilis* Lesson as the virtually monotypic type of *Ramphaoratus.*

The generic term *Chordeiles* has, like so many others, suffered at the hands of emenders, who, in seeking to "improve" the name, have in some cases made it worse. This is an excellent example of the impossibility of formulating any satisfactory rule for the emendation of names, because, as in the present instance, there are often several different ways of spelling the same word, by varying the terminations, all of which are orthographically and classically correct, and merely a matter of preference. The best course, therefore, from the standpoint of either reason or convenience, is to adhere to the original spelling of generic names, even though in some instances this be, from a classical point of view, evidently wrong. The name *Chordeiles* has been spelled in at least five different ways, including the original, and under the International Code of Nomenclature most of these would be regarded, so far as their form is concerned, as tenable generic terms. Mr. G. R. Gray in 1840[1] first changed the name to *Chordeilus*, designating the type, as in the original *Chordeiles*, *Caprimulgus virginianus* Gmelin. Next Tschudi in 1846[2] spelled it *Chordiles*, and included only "*Ch*[*ordiles*]. *semitorquatus* Cab.," which is, of course, the same as *Caprimulgus exilis* Lesson. In 1847[3] Cabanis emended it to *Chordediles*, and the type of this is, of course, the same as that of the original *Chordeiles.* In 1869[4] Mr. G. R. Gray credits Cabanis with the orthography "*Chordedilus*," supposedly used in 1861; but, after careful search, I have not been able to locate the reference. There may be still other spellings of *Chordeiles* buried in the literature, but I have been unable to discover them.

The word *Chordeiles* is derived from the Greek χορδή, a string (of a lyre or other musical instrument), and δεῖλη, evening, or twilight; and the longer forms of the word, *Chordediles* and *Chordedilus*, are better, orthographically, than the contraction *Chordeiles.* This, however, does not, of course, concern us in the scientific use of the name.

Literature.—Few extended papers on this genus have appeared, and most of its literature consists of scattered notes on the species, often in connection with birds of other genera and families, in faunal papers or books on birds of large groups or extended geographic areas. The two most valuable articles on the genus as a whole are, of course, Dr. Hartert's account in the Catalogue of Birds in the British Museum, and in the Tierreich. Full citation of these and the other more important papers dealing wholly or in part with the birds of the present genus are given in the following chronological list, from which, however, are omitted references to several of the original descriptions, since these can be found in the synonymy of the various forms of the genus:

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[1] List Genera Birds, 1840, p. 7.
[2] Fauna Peruana, Ornith., 1846, p. 21.
[3] [Wiegmann's] Archiv für Naturg., vol. 13, pt. 1, November, 1847, p. 346.
[4] Hand-List Gen. Spec. Birds, vol. 1, 1869, p. 61.

Spix, J. B.—Avium Species Novae, quas in itinere per Brasiliam annis 1817–1820 colleg. et descripsit; vol. 2, 1825, p. 2, pl. 2.

Cassin, John.—Illustrations of the Birds of California, Texas, Oregon, British and Russian America; 1855, pp. 237–239.

Burmeister, C. H. C.—Systematische Uebersicht der Thiere Brasiliens, vol. 2, 1856, pp. 393–397.

Baird, S. F.—Reports of Explorations and Surveys to Ascertain the most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean, vol. 9, 1858, pp. 150–155.

Sclater, P. L.—Notes upon the American Caprimulgidæ. Subfamily III. Caprimulginæ. Proceedings of the Zoological Society of London, 1866, pp. 131–135.

Pelzeln, August von.—Zur Ornithologie Brasiliens, 1 Abth., 1868, p. 14.

Baird, S. F.; Brewer, T. M.; and Ridgway, R.—History of North American Birds; Land Birds, vol. 2, 1874, pp. 399–408.

Taczanowski, Ladislas.—Ornithologie du Pérou, vol. 1, 1884, pp. 210–215.

Coues, Elliott.—Key to North American Birds, second edition, 1884, pp. 453–455.

Shufeldt, R. W.—Contribution to the Comparative Osteology of the Trochilidæ, Caprimulgidæ, and Cypselidæ. Proceedings of the Zoological Society of London, 1885, pp. 886–915, pls. 58–61.

Ridgway, Robert.—Manual of North American Birds, 1887, pp. 297, 300–301.

Coues, Elliott.—New Forms of North American *Chordiles*. Auk, vol. 5, January, 1888, p. 37.

Hartert, Ernst.—Chordeiles. Catalogue of the Birds in the British Museum, vol. 16, 1892, pp. 521, 609–618.

Salvin, Osbert; and Godman, F. D.—Biologia Centrali-Americana; Aves, vol. 2, November, 1894, pp. 395–398.

Bendire, Charles.—Life Histories of North American Birds, from the Parrots to the Grackles, with Special Reference to their Breeding Habits and Eggs, 1895, pp. 163–174.

Hartert, Ernst.—Das Tierreich. I. Lieferung: Podargidae, Caprimulgidae, und Macropterygidae, 1897, pp. 18–21.

Beddard, F. E.—The Structure and Classification of Birds, 1898, pp. 234–242.

Coues, Elliott.—Key to North American Birds, fifth edition, vol. 2, 1903, pp. 563, 568–570.

Hellmayr, C. E.—The Birds of the Rio Madeira. Novitates Zoologicae, vol. 1910, p. 378.

Key to species and subspecies.—The following key to the forms of *Chordeiles* is confessedly but little more than a comparative statement of characters, although purposely rather full; and while it may in some cases suffice for the identification of a bird in hand, its main purpose is, of course, to aid in comparison of specimens. So difficult, in fact, are the birds of this genus, that, owing to the wide range of individual and other variation in them all, it is quite out of the question to prepare a satisfactory key for use without recourse to properly determined material. The present attempt at a key is based entirely on adults, since the juveniles are not represented completely enough in our series to be included. This key is, of course, dichotomous, and first sets off the forms of each species, then the sexes of each.

KEY TO THE SPECIES AND SUBSPECIES OF CHORDEILES, BASED ON ADULTS.

a^1. Abdomen and crissum pure white; jugulum pale grayish; basal portion of tail, secondaries, and of inner primaries largely white; 3 outer primaries without white or buffy spots; axillars and part of under wing-coverts pure white. (*Chordeiles rupestris.*)

- b^1. Larger; fourth primary (counting from outermost) without a white spot; tail with much less brown at base and elsewhere; dark brown tips of rectrices not mottled with paler. (*Males.*)
  - c^1. Upper parts darker ---------------------- *Chordeiles rupestris zaleucus.*
  - c^2. Upper parts lighter.
    - d^1. Somewhat smaller; upper surface much darker, the deep brown markings decidedly larger; breast much less heavily spotted, sometimes even nearly immaculate -------------- *Chordeiles rupestris rupestris.*
    - d^2. Somewhat larger; upper surface much lighter, the deep brown markings decidedly smaller; breast much more heavily spotted. *Chordeiles rupestris xyostictus.*
- b^2. Smaller; fourth primary with usually a spot of white; tail with more brown at base and elsewhere; dark brown tips of rectrices mottled with paler. (*Females.*)
  - c^1. More grayish above; white spot on inner vane of fourth primary very large and reaching shaft; inner webs of rectrices with large dark brown spots or broad bars ------------- *Chordeiles rupestris zaleucus.*
  - c^2. More ochraceous or buffy above; white spot on inner vane of fourth primary absent or very small and not reaching shaft.
    - d^1. Larger; upper surface lighter, less heavily marked with dark brown; breast more heavily spotted -------- *Chordeiles rupestris xyostictus.*
    - d^2. Smaller; upper surface darker, more heavily marked with dark brown; breast less heavily spotted ----- *Chordeiles rupestris rupestris.*

a^2 Abdomen and crissum barred with blackish or brown; jugulum dark brown or blackish; basal portion of tail, secondaries, and of inner primaries not nearly all white, but mostly brown; 3 outer primaries with a large white or buffy spot; axillars and all of under wing-coverts heavily barred with dark brown or blackish.

- b^1. White or buffy patch on usually 4 outer primaries situated between the tips of the fifth and eighth primaries (counting from the outermost); primary coverts and outer webs of primaries and secondaries with conspicuous spots or bars of buff or ochraceous; first (outermost) primary usually shorter than second. (*Chordeiles acutipennis.*)
  - c^1. Larger; wing speculum larger and white; a white subterminal bar on tail; throat-patch white. (*Males.*)

d^1. Size greater (wing averaging more than 180 mm.). *Chordeiles acutipennis texensis.*

d^2. Size smaller (wing averaging less than 178 mm.).

e^1. Lower parts darker, more heavily barred. *Chordeiles acutipennis acutipennis.*

e^2. Lower parts lighter, less heavily barred.

f^1. Smaller (wing averaging under 160 mm.); pale bars on under side of tail more whitish; light bars on posterior lower parts averaging wider----------------*Chordeiles acutipennis exilis.*

f^2. Larger (wing averaging over 165 mm.); pale bars on under side of tail more buffy or ochraceous; light bars on posterior lower parts averaging narrower.

g^1. Light bars on tail broader; size averaging larger. *Chordeiles acutipennis inferior.*

g^2. Light bars on tail narrower; size averaging smaller. *Chordeiles acutipennis micromeris.*

c^2. Smaller; wing speculum smaller, and buff or largely so; no white subterminal bar on tail; throat-patch buff or ochraceous. (*Females.*)

d^1. Large (wing usually more than 174 mm., averaging over 170 mm.). *Chordeiles acutipennis texensis.*

d^2. Small (wing usually less than 168 mm., averaging under 170 mm.).

e^1. Above darker; lower surface darker and posteriorly more heavily barred; size smaller---------*Chordeiles acutipennis acutipennis.*

e^2. Below paler; lower surface lighter and less heavily barred; size greater.

f^1. Larger (wing averaging more than 166 mm.); light bars on tail broader----------------------*Chordeiles acutipennis inferior.*

f^2. Smaller (wing averaging less than 163 mm.); light bars on tail narrower.

g^1. Posterior lower parts darker; size greater. *Chordeiles acutipennis micromeris.*

g^2. Posterior lower parts lighter; size smaller. *Chordeiles acutipennis exilis.*

b^2. White or buffy patch on usually 5 outer primaries situated between the tips of the seventh and tenth primaries; primary coverts and outer webs of primaries and of secondaries without spots or bars of buff or ochraceous, or with at most faint markings; first primary usually longer than second. (*Chordeiles virginianus.*)

c^1. Larger; alar speculum larger, and plain white without dusky markings; a white subterminal bar on tail; gular crescent pure white; lower parts less buffy. (*Males.*)

d^1. Light mottlings of upper surface deeply tawny.

e^1. Posterior lower parts paler, more buffy or whitish; upper surface lighter; size larger (wing averaging 199.7 mm.). *Chordeiles virginianus henryi.*

e^2. Posterior lower parts darker, more ochraceous or tawny; upper surface darker; size smaller (wing averaging 168 mm.). *Chordeiles virginianus minor.*

d^2 Light mottlings of upper surface ochraceous buff or white.

e^1. Smaller (wing usually less than 188 mm.).

f^1. Upper surface darker, the pale mottlings much less numerous. *Chordeiles virginianus chapmani.*

f^2. Upper surface lighter, the pale mottlings much more numerous.

g^1. Smaller (wing usually less than 176 mm.); upper parts darker.
Chordeiles virginianus vicinus.

g^2. Larger (wing usually more than 180 mm.); upper parts lighter.
Chordeiles virginianus aserriensis.

e^2. Larger (wing usually more than 192 mm.).

f^1. Upper surface darker, more blackish, the light mottlings much less numerous.............. *Chordeiles virginianus virginianus.*

f^2. Upper surface lighter, more brownish, the light mottlings much more numerous.

g^1. Above darker, the light mottlings less numerous.
Chordeiles virginianus hesperis.

g^2. Above lighter, the light mottlings more numerous.

h^1. Dark brown of upper parts more rufescent, the light mottlings more ochraceous or buffy.
Chordeiles virginianus howelli.

h^2. Dark brown of upper parts more grayish, the light mottlings more grayish or whitish.
Chordeiles virginianus sennetti.

c^2. Smaller; alar speculum smaller, and more or less mottled with dusky; white subterminal bar on tail absent or very narrow; gular crescent buff or ochraceous; lower parts more buffy or ochraceous. (*Females.*)

d^1. Size small, the length of wing usually less than 185 mm., averaging less than 183 mm.

e^1. Upper surface paler (the ground color lighter and the light markings lighter or much more numerous); lower parts lighter; posterior lower surface less heavily barred.
Chordeiles virginianus aserriensis.

e^2. Upper surface darker (the ground color darker, and the light markings more deeply colored or much less numerous); lower parts darker; posterior lower surface more heavily barred.

f^1. Lower parts and light markings of upper surface more tawny or ochraceous; size smaller (wing averaging 168.7 mm.).
Chordeiles virginianus minor.

f^2. Lower parts and light markings of upper surface more grayish or whitish; size larger (wing averaging over 172 mm.).

g^1. Larger (wing averaging 179.4 mm.); posterior lower parts more whitish (less ochraceous); upper surface darker (the ground color more deeply blackish, the light markings less numerous).................... *Chordeiles virginianus chapmani.*

g^2. Smaller (wing averaging 173.2 mm.); posterior lower parts less whitish (more ochraceous); upper surface lighter (the ground color less deeply blackish, the light markings more numerous).................... *Chordeiles virginianus vicinus.*

d^2. Size large, the length of wing usually more than 190 mm., averaging more than 188 mm.

e^1. Upper surface more brownish, the light markings more ochraceous or tawny; posterior under surface more buffy or ochraceous.

f^1. Lower parts lighter, posteriorily less ochraceous or buffy (more whitish); upper surface lighter.. *Chordeiles virginianus howelli.*

f^2. Lower parts darker, posteriorly more ochraceous or buffy (less whitish); upper surface darker.. *Chordeiles virginianus henryi.*

e^2. **Upper surface more blackish, the light markings more whitish (less ochraceous or tawny); posterior under surface less buffy or ochraceous (more whitish).**

f^1. **Under surface somewhat darker, more tinged with buffy or ochraceous; ground color of upper parts more blackish and the light markings less numerous and somewhat more ochraceous.**
Chordeiles virginianus virginianus.

f^2. **Under surface somewhat lighter, less tinged with buffy or ochraceous; ground color of upper parts more brownish and the light markings more numerous and somewhat more whitish (less ochraceous).**

g^1. **Dark ground color of upper surface more grayish and somewhat lighter; light markings above more numerous and more grayish or whitish; lower surface slightly lighter.**
Chordeiles virginianus sennetti.

g^2. **Dark ground color of upper surface more brownish and somewhat darker; light markings above less numerous and more brownish, buffy or ochraceous; lower surface slightly darker.**
Chordeiles virginianis hesperis.

CHORDEILES VIRGINIANUS (Gmelin).

[*Caprimulgus*] *virginianus* GMELIN, Syst. Nat., vol. 1, pt. 2, 1789, p. 1028 (Virginia).[1]

Chars. sp. (*adult male*).—Interorbital region of skull very broad; longitudinal ridges on the median portion of frontal bones not strongly developed; maxillo-palatines relatively rather broadly subtriangular; vomer very narrow; antero-exterior processes of the palatines moderately slender; pterygoids with a decided exterior angle near the anterior end, whereby the terminal portion is usually more or less parallel with the posterior border of the palatine, and nearly or quite in contact with the latter; first (outermost) primary *usually* longer than the second; shortest secondary usually falling short of the tips of primary coverts by at least 5 mm.; distance from bend of folded wing to end of shortest secondary nearly always less than from latter point to end of fourth primary (counting from the outermost); tips of rectrices rounded; upper surface black or brownish black, mottled with whitish or buffy; tail dark brown or blackish, irregularly barred with white, gray or buff; wing-quills fuscous, usually the 5, occasionally the 4 or 6 outer primaries with a large white or rarely buffy spot between the tips of the seventh and tenth primaries (counting from the outermost); primary coverts, also outer webs of primaries and secondaries, either immaculate or with at most faint spots or bars; throat of male white; jugulum and breast dark brown or blackish, spotted with whitish, buff, ochraceous or tawny; remainder of lower surface whitish or buffy, barred with blackish or dark brown; axillars and under wing-coverts dark brown or blackish, barred with whitish or buffy.

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[1] Further synonymy under the various subspecies.

Adult female.—The female differs from the male in being of somewhat smaller size; in having the white wing-patch smaller and usually more or less mottled with dusky; the white subterminal tail-bar almost always absent, but if present much narrower; the light throat-crescent cream buff to tawny ochraceous, and often more or less spotted with dusky; lower parts usually more brownish, and posteriorly averaging much more buffy or ochraceous, the crissum rarely if ever pure white. Some of these sexual differences are, however, not so strongly marked in certain of the subspecies as in others.

First autumn plumage.—Although there is some difference in the various races of the species, the first autumn plumage is more or less intermediate between the juvenal and adult plumages. The *male* in first autumn plumage exhibits the following differences from the adult male: Upper parts with much more numerous pale mottlings, and thus lighter; white speculum smaller; primaries more or less broadly tipped with whitish or buffy; tail without subterminal white band; jugulum and upper breast much vermiculated with whitish, grayish or dull buffy; white throat-patch smaller, less well-defined, somewhat creamy or buffy, and much mottled, usually all over, with dusky. The *female* in first autumn plumage is similar to the adult of the same sex, but has the upper parts much more mottled with lighter; the upper breast and jugulum more vermiculated with paler; the buff throat-patch much more heavily marked with dusky, sometimes almost obliterated. In this condition the female is much like the male of the first autumn, but the throat is usually more deeply buff and more heavily spotted with dusky.

Juvenal plumage.—In this stage, which immediately precedes the first autumn plumage and succeeds the natal or nestling plumage, and which the bird wears for apparently only a short period, both male and female are usually much lighter above than in the adult plumage or that of the first autumn, the ground color being paler and the light mottlings prevailing; the lower surface has its dark areas also paler, the barring on breast more vermiculate and narrower; the bars on the rest of the lower surface lighter and less distinct; the throat-patch not very strongly indicated, and buff or ochraceous buff.

Natal plumage.—Upper parts grayish or buffy white, everywhere with coarse mouse gray, drab gray, or clove brown mottling; or fawn color with Prout's brown markings; below, white or cream white, mottled on throat and jugulum with gray or grayish brown; or pale fawn color, mottled on throat and jugulum with Prout's brown.

Seasonal variation.—The color differences due to season are very slight, probably in part, at least, because of the little wear to which the plumage is usually subject. What little there is consists chiefly in the somewhat more brownish or lighter shade of the dark parts, both above and below, after the breeding season; and the sometimes more deeply ochraceous or tawny of the light markings in freshly plumaged birds.

Molt.—The natal plumage is naturally of brief duration, and with the beginning of the bird's growth in size passes directly into the juvenal plumage, which, in turn, through a practically continuous molt gives way to the first autumn plumage by at least some part of September, at which time the bird is full grown. During this process the wing-quills and rectrices are grown only once, but the contour feathers of the juvenal plumage are wholly or in large part replaced. This livery is worn until January or February, when by a complete molt the fully adult plumage is assumed.

The adult birds after the breeding season molt usually the contour feathers, but not the wing quills and rectrices, this taking place between the middle of July and the middle of September, mostly between July 15 and August 15. The birds are thus, with wings and tail intact, even though molting other feathers, free to start on their migration. During January or February another molt, this time complete, takes place, so that by the time the birds are ready for their long northward journey they have an entirely new suit. These different plumages have already been described.

Individual variation.—The differences exhibited by various individuals of the same sex and age is very great, with respect to both size and color, in all of the forms of this species. This variation in color affects chiefly the amount of light mottling on the upper surface; the fineness or coarseness of these markings; their color, which in some subspecies is so decided that it amounts to two phases; the width of the dark barring on the abdomen; the width and number of dark bars on the crissum, these in some individuals being heavy and close together, in others narrow or far apart; and the length of wing and tail. In only one or two of the subspecies are there really two color phases, gray and ochraceous or tawny, for such differences are usually subspecific. There is, moreover, usually not much purely individual variation in the shade of the dark brown or blackish areas, though occasionally such instances crop out in some of the races.

Geographical variation.—For a bird so highly migratory, *Chordeiles virginianus* has responded rather remarkably well to the climate, environment, and other modifying influences of the various parts of its breeding range. The number of subspecies that now appear recognizable is nine, an increase of two over the previous number. Two of these are West Indian, the others continental. Nearly all of them correspond very well to the characteristics exhibited by races of other species which range over areas of similar physiographic conditions, the principal exception being *Chordeiles virginianus hes-*

peris, the Pacific coast race, which extends also eastward over the arid Great Basin. The four southeasternmost forms, *Chordeiles virginianus aserriensis*, *Chordeiles virginianus chapmani*, *Chordeiles virginianus vicinus*, and *Chordeiles virginianus minor* are the smallest, and of these the two island races, *C. v. vicinus* and *C. v. minor*, represent the minimum. The five remaining races are all of large size and practically alike in this respect. It is interesting to note the reduplication of certain characters, such as the coloration of the upper parts, in forms widely separated geographically. Thus *Chordeiles virginianus vicinus*, except for its small size and more ochraceous lower surface, would pass very well for the far distant *Chordeiles virginianus hesperis* of Oregon and California; while *Chordeiles virginianus minor* of Cuba bears similar resemblance to *Chordeiles virginianus henryi* of Arizona. Furthermore, it is doubtless worth while to mention the development of blackish or dark grayish races in the northern and eastern portions of North America; of a light grayish form on the northern Great Plains; of light, rather ochraceous races in the middle Rocky Mountains, the southern part of the Great Plains, and in Texas; of a rather dark, very tawny or ochraceous subspecies in arid Arizona and New Mexico; and of a dark, very tawny or ochraceous but very small bird on the Greater Antilles.

The nine forms of *Chordeiles virginianus* here recognized are commonly considered subspecies, and correctly so. The Cuban *Chordeiles virginianus minor* indicates by the range of its individual variation its close connection with *Chordeiles virginianus vicinus* of the Bahama Islands, which race in turn overlaps in the same way the characters of *Chordeiles virginianus chapmani*. The last mentioned passes gradually through geographical intermediates into *Chordeiles virginianus virginianus*. In the same manner *Chordeiles virginianus virginianus* intergrades with *Chordeiles virginianus sennetti* and *Chordeiles virginianus hesperis;* and the last with both *Chordeiles virginianus sennetti* and *Chordeiles virginianus howelli*.[1] *Chordeiles virginianus howelli*[1] intergrades geographically with *Chordeiles virginianus henryi*, and both of these with *Chordeiles virginianus aserriensis*, which in turn connects with *Chordeiles virginianus chapmani*.

Most of the characters distinguishing the subspecies of *Chordeiles virginianus* lie in differences of size, chiefly of wing and tail, sometimes also of tarsus and middle toe; of the general tone of the upper surface, whether light or dark, grayish, blackish, buffy, ochraceous or tawny, this lightness or darkness due to the difference in ground color and in the color, abundance, and fineness of the light markings; of the general tone of the lower surface, whether light or dark, grayish, buffy or ochraceous; and of the width of the dark bars on the abdomen.

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[1] See p. 57.

Geographical distribution.—As a species *Chordeiles virginianus* ranges, during the breeding season, in the West Indies and North America, form the northern edge of Mexico, the Gulf coast of the United States, and the Greater Antilles, north to the edge of the Barren Grounds in central Quebec, northern Ontario, southern Mackenzie, and northern Yukon; and from the Atlantic coast to the Pacific. It migrates across Mexico, Central America, and through the West Indies to southern South America, where the various subspecies probably winter together.

The summer ranges of two of the races, *Chordeiles virginianus aserriensis*[1] and *Chordeiles virginianus vicinus*, is somewhat restricted geographically, but most of the others are considerably extended. The northernmost form, *Chordeiles virginianus virginianus*, occupies an immense area stretching all the way across the continent, and at least equal in extent to the combined ranges of all the other subspecies.

The breeding areas of all but two of the forms of *Chordeiles virginianus* are continuous with some one or more of the others, although, of course, the lines delimiting the ranges on the accompanying map leave intermediate spaces due to lack of specimens from such regions. The subspecies of the Greater Antilles, *Chordeiles virginianus minor*, and that of the Bahama Islands, *Chordeiles virginianus vicinus*, are, of course, separated from each other and from the mainland forms by the surrounding water. The southeastern bird, *Chordeiles virginianus chapmani*, adjoins *Chordeiles virginianus virginianus*, *Chordeiles virginianus howelli*,[2] and *Chordeiles virginianus aserriensis*.[1] Also *Chordeiles virginianus virginianus* westward meets *Chordeiles virginianus howelli*,[2] *Chordeiles virginianus sennetti* and *Chordeiles virginianus hesperis;* and the last also reaches *Chordeiles virginianus sennetti*. The central form of the west, *Chordeiles virginianus howelli*,[2] lies surrounded by all of the six other mainland races, every one of which it touches at some part of the boundary of its range, as the distribution map shows. The far southwestern bird, *Chordeiles virginianus henryi*, adjoins, in addition, *Chordeiles virginianus aserriensis* on the southeast, and probably also *Chordeiles virginianus hesperis* on the northwest.

Zonal distribution.—In the West Indies during summer this species occupies the Upper Tropical Zone of the Neotropical Region; on the North American Continent the Lower Austral, Upper Austral,

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[1] See p. 71.

[2] See p. 57.

Transition, Canadian, and Hudsonian zones of the Nearctic Region. Four of the subspecies, *Chordeiles virginianus aserriensis*,[1] *Chordeiles virginianus chapmani*, *Chordeiles virginianus vicinus*, and *Chordeiles virginianus minor*, are confined to a single life zone; one, *Chordeiles virginianus sennetti*, to two zones, and each of the four remaining races is spread over several zones. The ranges of all conform very satisfactorily to the boundaries of their respective zones.

Phylogeny.—As a species *Chordeiles virginianus* is, as already remarked,[2] of South American origin. To the dispersal of strong-winged birds like this, physical features, such as high mountain ranges and wide expanses of water or desert, present no obstacle; and an unsuitable summer temperature and the lack of proper food at this season are therefore apparently its only real barriers. Thus its emigration from South America, from whatever primal cause, was easy, as was also the finding of a new home, since on account of its annual migratory return to the south, the only requisite for its new abode was a suitable place for reproduction. Its present distribution, routes of migration, and the evidently close relationship of the Cuban *Chordeiles virginianus minor* with *Chordeiles acutipennis acutipennis* from South America all indicate that *Chordeiles virginianus* reached the North American Continent through the West Indies. Birds that remained to breed on the Greater Antilles retained more nearly the original characters of the species, while those that pushed on northward and westward became more and more differentiated. The Floridian *Chordeiles virginianus chapmani* is, of course, the form least removed from the island birds, both geographically and phylogenetically. From this area the species probably spread northward and northwestward, where it developed into the large, dark race, *Chordeiles virginianus virginianus*. This, in turn, spread westward and southwestward over nearly the whole western United States, where environmental and perhaps other factors have produced the four large paler races of the more or less arid interior: *Chordeiles virginianus hesperis*, *Chordeiles virginianus sennetti*, *Chordeiles virginianus howelli*, and *Chordeiles virginianus henryi;* of which the last is undoubtedly phylogenetically as well as geographically farthest removed from *Chordeiles virginianus virginianus*. Simultaneously, in all probability, the advance of *Chordeiles virginianus chapmani* along the Gulf coast to southern Texas ultimately resulted in the development of the small, pale race in semiarid southern Texas. The uniformity of *Chordeiles virginianus virginianus* throughout its wide breeding range from ocean to ocean is apparently due to the comparative uniformity of climatic and environmental conditions over this area, together with the very brief period of each year that the bird spends on its breeding grounds, where alone the differentiating influences have opportunity to exert themselves. Under these conditions it is entirely probable that any future development of geographical races from what is now the subspecies *Chordeiles virginianus virginianus* will be exceedingly slow.

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[1] See p. 71.

[2] See p. 12.

Migration.—Comparatively few birds of any kind exceed this nighthawk in the length of their migration journeys, and very few land birds travel as far. From the Arctic Circle in the Territory of Yukon to Patagonia is more than 8,000 miles, but the nighthawk's long wings and consequent powers of flight enable it easily to perform this extensive regular annual journey. Judging from the scarcity of available records, it seems probable that the passage through Mexico and Central America, and over the West Indies, the Gulf of Mexico, and the Caribbean Sea to northern or central South America is made with considerable rapidity.

Like most other birds which travel long migration routes, this species is, generally speaking, an early migrant in autumn and a comparatively late arrival in spring. Notwithstanding this, the first individuals in spring sometimes reach the southern border of the United States by March 15, and the latest stragglers in autumn occasionally prolong their stay in the same region until even November 27; but these dates are of course exceptional, since the spring appearance is usually three or four weeks later, and the autumnal disappearance a month or so earlier. The nighthawk usually reaches Montreal and Quebec early in May; Grand Falls, the northern limit of its range in central Quebec, during the last week of May; Fort Chipewyan, Alberta, the last week of May; Fort Wrigley, Mackenzie, the first week of June; and British Columbia by the last of May or first of June. On the other hand, migrant birds are sometimes still in southern Texas on May 29, and even in Costa Rica as late as May 27.

The southward migration must begin very soon after the young are on the wing, since transient birds from the north appear in the middle and southern United States by the first of August, sometimes by the middle of July; and they reach Nicaragua by the middle of September. Montreal in Quebec, also southern Manitoba and British Columbia, are deserted usually during the first two weeks of September, and Fort McMurray, Alberta, in August. It is thus evident that the migratory movements, in the United States at least, cover a total period of more than four months in autumn and of nearly three months in spring. There is thus in Colorado and the surrounding States a scant three or four weeks' period of summer, from about June 15 or 20 until the middle of July, during which the presence of a nighthawk is presumptive evidence of its breeding in the locality.

The above remarks apply to *Chordeiles virginianus* as a species, since sufficient data have not yet accumulated to work out the migration of the subspecies separately. It is more than possible that an adequate series of specimens of the various races (for nothing else will answer) would show some interesting differences in their migration. The migration routes, however, by which several of the different races reach their common winter home in South America are discernible in a general way from the data now available. Concerning the migration of *Chordeiles virginianus minor* and *Chordeiles virginianus vicinus* we know nothing at all. The two eastern forms, *Chordeiles virginianus chapmani* and *Chordeiles virginianus virginianus*, fly southward across the Gulf of Mexico to Yucatan and through Central America to South America, or through the West Indies and across the Caribbean Sea. The return journey is apparently by the same route. The route of *Chordeiles virginianus sennetti* is unknown; but all the other western races pass south through Mexico and Central America and return the same way. A possible but unproved variation of this may take some or all of the birds from the easternmost part of the ranges of *Chordeiles virginianus howelli*, *Chordeiles virginianus aserriensis*, and *Chordeiles virginianus hesperis* across the western end of the Gulf of Mexico to Yucatan, and thence through Central America. There is no authentic record of any of these western races in the United States east of Illinois, or anywhere in the West Indies.

Habits.—Few birds bear such a misnomer as the nighthawk; for it is not a hawk, or even nearly related to one, nor is it a night-flier, except by moonlight, though it prefers the twilight and the declining hours of the day, as well as cloudy weather. It lives mostly in the open country, such as the plains and prairies, and is a common sight along roadsides, fence-rows, railroad tracks, and the like. It avoids the deep forest, though it often enters the outskirts of woodland. Its flight is strong, swift, and light, at times not a little suggestive of the sparrow hawk (*Cerchneis sparveria*) or other of the small falcons. It is much on the wing, and some of its aerial performances are really wonderful. Its ordinary call on the wing is a sharp one- or two-syllabled note something like "aeh-eek" or "peenk," and remarkably characteristic. The well-known booming sound so frequently heard is made by the quick passage of air between the primaries as the bird is suddenly checked in rapidly descending flight. Its food, which it obtains on the wing, consists probably all of insects, such as moths, flies, beetles, grasshoppers, and crickets.

This nighthawk lays its eggs on the ground on bare rocks, or even on the flat roofs of houses in cities. No nest at all is constructed. The time of nesting is somewhat earlier in the southern part of its range; but for the species as a whole, it lasts from late April to early August, though there is apparently but one brood.

The two elliptical eggs are white, buff or gray, much marked throughout with blackish, drab, gray, olive, and plumbeous.

History.—This species was first brought to scientific notice in 1743, by Mark Catesby, in the supplement to his "Natural History of Carolina, Florida, and the Bahama Islands." He, however, confused the nighthawk (*Chordeiles virginianus*) and the whip-poor-will (*Setochalcis vocifera*), in which mistake subsequent authors for more than 50 years followed him. Alexander Wilson, in his "American Ornithology,"[1] was the first to discriminate the two species satisfactorily, and to point out in detail the real differences between them.

The first technical description, however, applicable to any form of the species appeared in 1789, when Gmelin called the northeastern bird *Caprimulgus virginianus.*[2] No subdivision took place until 1855, when Cassin separated the lighter western birds as *Chordeiles henryi.*[3] In the following year the Cuban bird was described under two names, of which Doctor Cabanis' *Chordediles minor*[4] has priority. Not until 1888 were any further races added, in which year *Chordeiles virginianus sennetti* was discovered and published,[5] and the Florida bird separated as *Chordeiles popetue* [=*virginianus*] *chapmani*, both by Doctor Elliott Coues.[5] Eight years later Mr. George K. Cherrie named a migrant bird from Costa Rica as *Chordeiles virginianus aserriensis*,[6] which now proves to be the same as a hitherto unrecognized race from southern Texas. In 1903, Mr. J. H. Riley set apart a Bahama race as *Chordeiles virginianus vicinus;*[7] and in 1905 Mr. Joseph Grinnell separated the birds from the Pacific coast of the United States as *Chordeiles virginianus hesperis.*[8] In the present paper one further subdivision is made, by restricting *Chordeiles virginianus henryi* chiefly to Arizona and New Mexico, and creating a new race from the northern and eastern part of its former range, Texas to Wyoming, under the name *Chordeiles virginianus howelli.*[9] Although some of these above-mentioned forms of *Chordeiles virginianus* originally passed as distinct species, all are clearly but subspecies, since abundant evidence of intergradation exists in every case, either through geographical or individual intermediates.

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[1] Amer. Ornith., vol. 5, 1812, pp. 78–82.

[2] Syst. Nat., vol. 1, pt. 2, 1789, p. 1028.

[3] Illust. Birds Cal., Texas, Ore., Brit. and Russ. Amer., vol. 1, 1855, p. 239.

[4] Journ. f. Ornith., January, 1856, p. 5.

[5] Auk, vol. 5, January, 1885, p. 37.

[6] Auk, vol. 13, April, 1896, p. 136.

[7] Auk, vol. 20, October, 1903, p. 432.

[8] Condor, vol. 7, Nov. 22, 1905, p. 170.

[9] See p. 57.

CHORDEILES VIRGINIANUS VIRGINIANUS (Gmelin).

[*Caprimulgus*] *virginianus* GMELIN, Syst. Nat., vol. 1, pt. 2, 1789, p. 1028 (Virginia) (based on: [*Caprimulgus*] *europæus* β.[=]*Caprimulgus minor americanus*, LINNÆUS, Syst. Nat., ed. 12, vol. 1, 1766, p. 346; *Hwipperiwill*, KALM, Resa Norra Amer., vol. 3, 1761, p. 93 [Racoon, New Jersey]; *Caprimulgus virginianus*, BRISSON, Ornith., vol. 2, 1760, p. 477 [Virginia]; *Whip-poor-will, Caprimulgus minor Americanus*, CATESBY, Nat. Hist. Carolina, Florida, and Bahama Islands, vol. 2, Appendix, 1743, p. 16, pl. 16 [Virginia]; *Whip-poor-will*, EDWARDS, Nat. Hist. Birds, vol. 2, 1747, p. 63, pl. 63 [Virginia]; *Le Whip-pour-will*, BUFFON, Hist. Nat. des Oiseaux [orig. ed.], vol. 6, 1779, p. 534 [Virginia]; *Longwinged Goatsucker*, PENNANT, Arctic Zool., vol. 2, 1785, p. 436 [excl. pl. 18], No. 337 [Charleston, South Carolina, to Henly House, Albany River, Ontario]; *Virginia Goatsucker*, LATHAM, Gen. Synop. Birds, vol. 2, pt. 2, 1783, p. 595 [Virginia]).

Caprimulgus popetue VIEILLOT, Ois. Amer. Sept., vol. 1, 1807, p. 56, pl. 24 (Nova Scotia).

Caprimulgus americanus WILSON, Amer. Ornith., vol. 5, 1812, p. 65, pl. 40 (eastern Pennsylvania) (nec *Caprimulgus americanus* LINNÆUS, 1758, qui *Siphonorhis americanus* Auct.).

Caprimulgus variegatus VIEILLOT, Nouv. Dict. d'Hist. Nat., 2d ed., vol. 10, 1817, p. 238 (Paraguay).

C[*aprimulgus*]. *jaspideus* MERREM, in Ersch und Gruber, Allgem. Encycl. Wissensch. und Künste, sec. 1, vol. 15, 1826, p. 148 (Paraguay).

Chars. subsp.—Size large; upper parts black or blackish, the light markings sparse or only moderately numerous, and mostly whitish or buffy, with very little tawny; general tone of lower surface relatively dark, the dark areas of anterior portion blackish, the posterior part slightly washed with cream color or buff, and heavily barred with blackish.

Description.—Adult male, No. 38895, Museum Comparative Zoölogy, Pocantico, New York, May 19, 1891; W. E. D. Scott; original number, 11425. Upper surface blackish clove brown, irregularly spotted with brownish white, cream white, cream color, cream buff, buff, ochraceous buff, and ochraceous, these markings most numerous on cervix, largest on scapulars (which are also much mottled with grayish and buffy on their subterminal unexposed portions), least frequent on pileum and back, which are almost unmarked, and in the form of irregular bars on the upper tail-coverts; tail grayish clove brown, crossed by about seven (none of which is terminal) irregular and broken bars of brownish white, buffy white, and pale brown, these bars widest on the middle pair of rectrices, and by a broad subterminal band of white on all but the two middle feathers; wing-quills dark brown, like the tail, but slightly darker, the outer six primaries crossed by a broad band of pure white posteriorly (distally) to the tip of the ninth primary (counting from the outermost); secondaries and inner primaries narrowly tipped with pale brownish; outer half or so of the inner webs of the secondaries with narrow brownish or buffy white bars; the tertials mottled with light brown, brownish white, and buffy white in the form of broad but much broken and obsolescent bars; superior wing-coverts grayish clove brown like the quills, the primary coverts immaculate, the others spotted irregularly and rather thickly, but not confluently, with brownish white, cream white, and cream buff; moustachial stripe and sides of head and neck blackish clove brown, the auriculars and subocular region narrowly streaked with deep tawny, the sides of neck anteriorly broadly streaked with tawny ochraceous, posteriorly more or less spotted with buffy and brownish white; the moustachial stripe spotted with cream white and buff; a superciliary stripe consisting of small spots of anteriorly cream white, posteriorly cream buff, confluent with the light streaks on the side of the neck and the light spots on the cervix; lores mixed with whitish; a broad gular crescent and the middle of chin pure white; jugulum and upper breast grayish seal brown, the former with conspicuous subtriangular spots of tawny ochraceous and cream buff, the latter with spots and irregular or broken bars of cream color, cream white, and brownish white; rest of lower surface cream buff, heavily barred with the brown color of wing-quills, these bars widest and farthest apart on crissum; inferior wing-coverts brown like the wings, somewhat spotted and irregularly barred with cream white, cream buff, and ochraceous buff; axillars dark brown, barred with buff and cream white; edge of wing along the alula white.

Iris black or hazel brown; bill black or dark brown; feet dark brown, dull grayish brown, or plumbeous.

Measurements.—Male: Total length (in flesh), 235–247.6 (average, 241.9) mm.;[1] extent of wing, 596.9–622.3 (610.7).[1]

Female: Total length (in flesh), 228.6–254 (241.5);[2] extent of wing, 533.4–606 (574.4).[3]

Male:[4] Wing, 184–208 (average, 198) mm.; tail, 106–118 (110.9); exposed culmen, 6.1–7.5 (6.5); tarsus, 13.5–15.2 (14.4); middle toe, 13–15.5 (14.9).

Female:[5] Wing, 187.5–203 (196.5) mm.; tail, 105–118.5 (112); exposed culmen, 6.2–7.2 (6.7); tarsus, 13.8–15.5 (14.8); middle toe, 14–16.5 (15.5).

Type-locality.—Eastern Virginia.

Geographical distribution.—Eastern and northwestern North America, south in winter to southern South America. Breeds in the

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[1] Six specimens.

[2] Nine specimens.

[3] Seven specimens.

[4] Twelve specimens, from Nova Scotia, Quebec, Alberta, British Columbia, New Hampshire, Massachusetts, and New York.

[5] Ten specimens, from Nova Scotia, Ontario, Maine, Massachusetts, Pennsylvania, and West Virginia.

Upper Austral, Transition, Canadian, and lower part of the Hudsonian zones, north to Grand Falls on the Hamilton River, and to Lake Mistissini, central Quebec; Moose Factory, northern Ontario; York Factory and Fort Churchill, northeastern Manitoba; Fort Chipewyan and Fort Smith, northeastern Alberta; Fort Resolution and Fort Providence, central southern Mackenzie; Fort Wrigley, the western part of Great Bear Lake, and the Mackenzie River just below Fort Good Hope, central western Mackenzie; and La Pierre House, northern Yukon; west to La Pierre House, northern Yukon; mouth of the Tatchun River, White Horse Rapids, and Caribou Crossing on the Yukon River, and the northern end of Lake Teslin in central southern Yukon; Telegraph Creek, the Coast Range, Lund on Malaspina Inlet, Comox, and Errington on Vancouver Island, western British Columbia; south to Victoria, southwestern British Columbia; Semiahmoo, northwestern Washington; Sumas and Osoyoos Lake, central southern British Columbia; Sproat's Landing on the Columbia River, southeastern British Columbia; Banff, southwestern Alberta; Prince Albert and Quill Lake, south central Saskatchewan; Carberry, southern Manitoba; Walker and St. Cloud, central Minnesota; Waseca, central southern Minnesota; Forest City, central northern Iowa; Ames, central Iowa; Indianola, south central Iowa; Omaha, Lincoln, and Beatrice, southeastern Nebraska; Topeka, central eastern Kansas; Jasper in Jasper County, and Marble Cave in Stone County, southwestern Missouri; Pettigrew, northwestern Arkansas; Mammoth Spring, central northern Arkansas; Monteer, central southern Missouri; St. Louis, central eastern Missouri; Odin, southern Illinois; Terre Haute, Bloomington, and Bedford, southern Indiana; Bowling Green, central southern Kentucky; Nashville, central Tennessee; Chattanooga, southeastern Tennessee; Ellijay and Young Harris, central northern Georgia; Asheville and Weaverville, southwestern North Carolina; Wytheville, Lynchburg, Newport News, and Cape Charles, southern Virginia; east to Cobbs Island, eastern Virginia; Ocean View, eastern Delaware; Five Mile Beach and Sea Isle City, eastern New Jersey; Montauk, eastern Long Island; Newport, southern Rhode Island; Woods Hole, Boston, and Ipswich, eastern Massachusetts; Portsmouth, southeastern New Hampshire; Bath, Mount Desert Island, and Calais, southern Maine; Barrington, Halifax, and Sydney, eastern Nova Scotia; Anticosti Island, and the Natashkwan River, eastern Quebec; and the Bay of Islands, western Newfoundland. Migrates south through Colorado, Texas, eastern Mexico, southeastern United States, the Bermuda Islands, Cuba, Isle of Pines, Jamaica, Barbados, Costa Rica, and Panama, to South America. Winters in South America, north to the Orinoco River in central Venezuela, and Bogota, central Colombia; west to Bogota, Colombia; Matto Grosso, western Brazil; Tucuman, northwestern

Argentina; and Cordoba, north central Argentina; south to Barracas al Sud, Province of Buenos Aires, central eastern Argentina; and east to Buenos Aires, central eastern Argentina; Sao Paulo and Rio de Janeiro, southeastern Brazil; and Guiana. Accidental north to Melville Island, northern Canada.

Remarks.—In the adult female of this race the posterior lower parts are much more tinged with buff or ochraceous than in the male; and the ground color of the upper surface averages lighter, duller, and more brownish, with more numerous light markings, which are more buffy or ochraceous.

Birds in first autumn plumage are, on the upper surface, almost like the average of adult *Chordeiles virginianus hesperis*, and similar also to the adult of *Chordeiles virginianus sennetti*, but the dark areas are more intensely blackish, though occasional specimens are indistinguishable in this respect.

The adult male is normally very deeply blackish above, with a comparatively small amount of light mottling; but he varies individually to dull brownish, with a large amount of light marking, until he becomes almost indistinguishable from dark examples of *Chordeiles virginianus howelli.*[1] Light-colored specimens of this sort are No. 88139, U.S.N.M., Stamford, Connecticut, and No. 13249, E. A. and O. Bangs, Santa Fe, Isle of Pines. The light markings of upper parts are usually grayish, creamy white, and buff, but vary sometimes to almost pure white, sometimes to deep tawny. The ground color of the lower parts is normally grayish white, and varies little, though sometimes almost pure white, sometimes slightly washed with buff. The female is also variable above, and occasionally (such as No. 174915, U.S.N.M., Cumberland County, New Jersey; and No. 46920, Mus. Comp. Zoöl., Long Island, New York) very closely resembles adult male *Chordeiles virginianus hesperis*. The ground color of the ventral surface is commonly cream white, but deepens in some birds to ochraceous buff. The light throat-patch is normally buff, ranging, however, on the one hand to cream white, on the other to deep ochraceous buff.

Notwithstanding its vast range, this subspecies exhibits almost no geographical variation, except where its breeding area closely approaches that of some other race. Adult birds from Vancouver Island, British Columbia, and from the Yukon River in Yukon are apparently in no respect, of either size or color, distinguishable from those of Nova Scotia, eastern Quebec, and New England. A single female from Sproat's Landing, southeastern British Coulmbia (No. 970, Victoria Mem. Mus., June 26, 1890), and another, a male, from Banff, Alberta (No. 1256, Victoria Mem. Mus., June 8, 1891), both seem to be typical of *Chordeiles virginianus virginianus*, and apparently represent the breeding form at these localities. Specimens from Ashcroft, Lac La Hache, Hope, and Chilliwack, in southern British Columbia, have considerable indication of the more brownish, more heavily light-mottled upper surface of *Chordeiles virginianus hesperis*, but are, on the whole, nearer *Chordeiles v. virginianus.* An adult from Carberry, Manitoba (No. 57875, Am. Mus. Nat. Hist., July 29, 1892), and a half-grown young from the same locality (No. 57876, Am. Mus. Nat. Hist., Aug. 1, 1892) are somewhat vergent toward *Chordeiles virginianus sennetti*, but are not pale enough above for the latter and apparently belong under the typical form. Another adult from Winnebago County, Iowa (No. 26724, A. N. S. Phila., Sept. 1, 1879), which seems to represent the breeding bird of this locality, is likewise intermediate, but nearer *Chordeiles v. virginianus.* A typical example of *Chordeiles v. virginianus* from Trail, extreme southeastern British Columbia (No. 2811, Victoria Mem. Mus., June 14, 1902), is doubtless a migrant, since the breeding subspecies at this place is *Chordeiles virginianus hesperis.* Similarly migrant also doubtless are two adult males (No. 15638 and No. 15639, L. B. Bishop, June 5, 1906) from Maple Creek, southwestern Saskatchewan, where the breeding subspecies is *Chordeiles v. hesperis.* Two other adult males (No. 13449 and 3578, L. B. Bishop), respectively from Stump Lake, N. Dak., August 2, 1905, and Towner County, N. Dak., June 8, 1897, are likewise best considered migrant *Chordeiles v. virginianus*, though verging a little toward *C. v. hesperis*, since the breeding bird of these localities is *Chordeiles virginianus sennetti*, and these two specimens are too dark for that race. Another example (No. 63939, U.S.N.M.), from Pembina, N. Dak., taken June 16, 1873, is unquestionably perfectly typical of *C. v. virginianus*, and hence a belated migrant, for we have an actually breeding female of *Chordeiles virginianus sennetti* from this same locality, taken three days earlier. A single individual from Cushion Lake, southeastern Missouri (No. 205012, U.S.N.M.), is typical *Chordeiles v. virginianus*, but does not, in all probability, represent the breeding form of this locality, which form is reasonably sure to be *Chordeiles virginianus chapmani.* A single male, perhaps a migrant, from Richland County, southeastern Illinois (No. 90781, U.S.N.M., May 25, 1883), is apparently nearer the typical subspecies, though the breeding bird of the adjoining county of Wabash is *Chordeiles virginianus chapmani.*

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[1] See p. 57.

Birds taken on Smiths Island, southeastern Virginia, prove to be smaller than northern specimens, and are, in fact, about half way between *Chordeiles virginianus virginianus* and *Chordeiles virginianus chapmani;* but, both size and coloration taken into consideration, seem to be nearer the former. A single adult female, from Fort Macon, North Carolina (No. 57903, U.S.N.M.), taken June 10, 1869, seems to be undoubtedly of the present race, being altogether too large for *Chordeiles virginianus chapmani;* if so, it is only a late migrant, because a male collected at the same locality on the same day is certainly *Chordeiles v. chapmani*, the breeding form of the region. Specimens from various parts of the breeding range of *Chordeiles virginianus virginianus* exhibit the following average measurements:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Eight males, from Quebec, Nova Scotia, New Hampshire, Massachusetts, and New York	198.1	111.5	6.5	14.6	15
Two males, from Alberta	192.8	111.5	6.5	13.8	14
Two males, from British Columbia	202.5	107.8	6.8	14.3	15.3
Five males, from southeastern Virginia	198.3	110.1	6.6	14.5	15.2
Ten females, from Nova Scotia, Ontario, Massachusetts, Maine, Pennsylvania, and West Virginia	196.5	112	6.7	14.8	15.5
Six females, from southeastern Virginia	185	109.3	7	14.7	15.1

In view of the fact that the migration route of this subspecies is across the Gulf of Mexico and through, or rather over, the West Indies, there are surprisingly few records from these islands, even the Greater Antilles. A single specimen, taken, September 29, 1887, on the island of Barbados,[1] is the only authentic record from any of the Lesser Antilles. There are no certain records from any part of Mexico excepting the northeastern corner (Nuevo Leon, May 19[2]), nor from Central America northwest of Costa Rica. The single bird found dead, in 1820, on Melville Island, Franklin Territory, Canada,[3] was, of course, a mere straggler so far beyond even the northernmost extension of the breeding range of the subspecies.

Except, perhaps, in the southern part of its range, *Chordeiles virginianus virginianus* rears but a single brood. In the south it breeds chiefly in May and June, and there is record of eggs as early as April 28; in the north, during June and July, and there are unhatched eggs to be found sometimes as late as July 31.

The earliest binomial name for the eastern nighthawk is *Caprimulgus virginianus* of Gmelin,[4] based on the bird from Virginia. His diagnosis is in full as follows:

> C[aprimulgus]. fuscus, transversim griseo-fusco et hinc inde cinereo-varius, subtus ex rubescente albus transversim striatus, menti macula trigona alba, area oculorum et cervice aurantiis maculis varia.
>
> *Habitat aestate in* America *septentrionali, praesertim* Virginia, *europaeo minor, 8 pollices longus, in montanis, vespere prope domus frequens, eoque tempore*

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[1] Feilden, Ibis, 1889, p. 486.

[2] Hartert, Cat. Birds Brit. Mus., vol. 16, 1892, p. 611.

[3] Sabine, Suppl. Appendix Parry's 1st. Voyage, 1824, p. cxciv.

[4] Syst. Nat., vol. 1, pt. 2, 1789, p. 1028.

> *ad ortum solis usque saepissime altissima voce wiperi-wip clamans, ova 2 viridia, maculis et striis atris varia in campo aperto in nuda terra pariens. Caro sapida.*
>
> Genae *ex cinereo fuscae;* remiges *atrae, 5 primae circa medium,* rectrices *extimae prope apicem macula alba notatae;* pedes *incarnati.*

From this it is readily discernible that his description of the bird is applicable to only the nighthawk, but that the particulars concerning its habits relate nearly or quite all to the whip-poor-will (*Setochalcis vocifera*). The source of this confusion lies in the accounts of the species given by the eight previous authors whose works Gmelin cites, which citations we have given in full above in the synonymy of the present race.[1] Of these the *Caprimulgus minor americanus* of Linnæus[2] is based exclusively on the descriptions in the works of Catesby, Kalm, and Edwards. Catesby's account[3] of his "Whip-poor-will," or "*Caprimulgus minor Americanus*," from Virginia, which is apparently the earliest extended notice of the species, relates certainly, so far as the plate and description of the bird are concerned, though neither is entirely accurate, to *Chordeiles virginianus virginianus;* but the habits that he describes are just as certainly those of *Setochalcis vocifera.* What Catesby says about habits is practically all in a letter from a Mr. Clayton, of Virginia, which he quotes, as follows:

> The *Whippoorwill* is not so large as the Bird called here the *East-India Bat,* i. e., *Caprimulgus,* but in shape, and colour of the feathers, it very much resembles it, having also at each side of its mouth three or four stiff black hairs like those of a horse's main, two or three inches long. These birds visit us about the middle of April, from which time, till the end of June, they are heard every night, beginning about dusk, and continuing till break of day; but it is chiefly in the upper or western parts that they are so very frequent. I never heard but one in the maritime parts, although my abode has been always there; but near the mountains, within a few minutes after sun-set, they begin, and make so very loud and shrill a noise all night, which the echoes from the rocks and sides of the mountains increase to such a degree, that the first time I lodged there I could hardly get any sleep. The shooting them in the night is very difficult, they never appearing in the daytime. Their cry is pretty much like the sound of the pronunciation of the words *Whip-poor-will,* with a kind of chucking noise between every other or every two or three cries, and they lay the accent very strong upon the last word *Will,* and least of all upon the middle one.
>
> The *Indians* say these Birds were never known 'till a great massacre was made of their countryfolks by the *English,* and that they are the Souls or departed Spirits of the massacred *Indians.* Abundance of people here look upon them as Birds of ill omen, and are very melancholy if one of them happens to light upon their house, or near their door, and set up his cry (as they will sometimes upon the very threshold) for they verily believe one of the family

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[1] See p. 35.

[2] Syst. Nat., ed. 12, vol. 1, 1766, p. 346.

[3] Nat. Hist. Carolina, Florida, and Bahama Islands, vol. 2, Appendix, 1743, p. 16, pl. 16.

will die very soon after. These Birds, as I have been credibly informed, breed exactly as the *Goat-Sucker* before mentioned, which is thus: they lay only two eggs of a dark greenish colour, spotted and scrawled about with black, in the plain beaten paths, without the least sign of any nest, upon which they sit very close, and will suffer a very near approach before they fly off.

Kalm,[1] who calls the bird "Hwipperiwill," gives much the same sort of an account. Edwards,[2] Latham,[3] and Buffon,[4] all give a good description of the nighthawk, but reproduce Catesby's account of the habits of the whip-poor-will, Edwards giving it in Catesby's (=Clayton's) own language. Pennant's description of his "Longwinged Goatsucker"[5] relates wholly to *Chordeiles virginianus*, but his plate is *Setochalcis vocifera*. Brisson gives a detailed description,[6] which applies wholly to the nighthawk. It is interesting to note how closely all these subsequent authors have copied Catesby, with very little or no additional information; except Brisson, whose long, careful description is evidently original. Since in all these accounts the portions descriptive of the plumage and other specific characters relate entirely to the nighthawk, the name *Caprimulgus virginianus* of Gmelin has a clear title.

The *Caprimulgus popetue* of Vieillot,[7] from Nova Scotia, is, of course, a synonym of *Caprimulgus virginianus* Gmelin, being many years posterior, though a number of authors have used it for the species. Wilson's *Caprimulgus americanus*,[8] from eastern Pennsylvania, is also the same. There seems to be no reasonable doubt concerning the identification of *Caprimulgus jaspideus* Merrem[9] and *Caprimulgus variegatus* Vieillot,[10] both from Paraguay, for the accompanying descriptions agree very closely with *Chordeiles virginianus virginianus*.

As will be seen by the quotation from Gmelin given above,[11] Virginia is mentioned as the particular part of North America in which this bird was supposed to be found. Most of the other authors whom Gmelin cites give Virginia as the locality also. They mention *western* Virginia especially, but since this is so evidently based on the account of habits, which are plainly those of *Setochalcis vocifera*, and since the specimens that served as the basis for the descriptions came in all probability from the eastern portion of this State, it seems best to fix the type-locality, which we do here, as eastern Virginia.

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[1] Resa Norra Amer., vol. 3, 1761, p. 93.

[2] Nat. Hist. Birds, vol. 2, 1747, p. 63, pl. 63.

[3] Gen. Synop. Birds, vol. 2, pt. 2, 1783, p. 595.

[4] Buffon, Hist. Nat. des Oiseaux, vol. 6, 1779, p. 534.

[5] Arctic Zool., vol. 2, 1785, p. 436.

[6] Ornith., vol. 2, 1760, p. 477.

[7] Ois. Amer. Sept., vol. 1, 1807, p. 56, pl. 24.

[8] Amer. Ornith., vol. 5, 1812, p. 65, pl. 40.

[9] In Ersch and Gruber, Allgem. Encycl. Wissensch. und Künste, sec. 1, vol. 15, 1826, p. 148.

[10] Nouv. Dict. d'Hist. Nat., 2d. ed., vol. 10, 1817, p. 238.

[11] See p. 40.

Specimens examined.—Of this race 198 specimens have been examined, from the following localities:

Alberta.—Athabaska Lake (June 1, 1901); Slave River, 10 miles below Peace River (June 7, 1901); Banff (June 8, 1891).

British Columbia.—Wayne Island (Aug. 19, 1892); Vernon (Aug. 4, 1892); Ashcroft (July 2, 3, 5, and 8, 1889); Sumas (Aug. 8, 1891); Trail (June 14, 1902); Errington, Vancouver Island (Aug. 29 and 30, 1910; Sept. 9 and 15, 1910); Osoyoos Lake (June 6, 1905); Hope (Sept. 3, 1890); Lac La Hache (June 29, 1892); Sproat's Landing, Columbia River (June 26, 1890); Chilliwack (June 29, 1859); Okanagan Falls (June 19 and 21, 1913); Penticton (June 23 and 27, 1913); New Westminster (June 4, 1886); Victoria (July 25, 1894).

Mackenzie.—Mackenzie River, below Fort Good Hope.

Manitoba.—Carberry (July 29, 1892; Aug. 1, 1892); Lake Winnepegosis (July 3 and 5, 1913).

Nova Scotia.—Digby (July 14, 1907); Newport (Aug. 21, 1900).

Ontario.—Moose Factory (Aug. 4, 1860; Aug. 16, 1860); Brunswick House (June 9, 1908); Point Pelee (May 29, 1909).

Quebec.—Fauriel, Grosse Isle, Magdalen Islands (June 15, 1901).

Saskatchewan.—Maple Creek (June 5, 1906).

Yukon.—White Horse Rapids, Yukon River (July 11, 1899); Caribou Crossing, Yukon River (June 27, 1899).

Colorado.—Gunnison (Aug. 24, 1885).

Connecticut.—Stamford; East Hartford (Aug. 5, 1893).

Florida.—Whitfield (May 2, 1903; Apr. 15, 23, and 28, 1903); Dry Tortugas (Apr. 13 and 14, 1890); Amelia Island (May 16, 1906; Apr. 20, 1906).

Illinois.—Jacksonville (May 21, 1892); Lake Forest (May 19 and 23, 1906); Richland County (May 25, 1883).

Iowa.—Winnebago County (Aug. 12 and 26, 1879; Sept. 1 and 3, 1879); Grinnell.

Kansas.—Hamilton (Aug. 10, 1913).

Maine.—King and Bartlett Lake, Somerset County (July 15, 1893); Island Falls (Sept. 17, 1878).

Maryland.—Cornfield Harbor (July 18, 1894); Takoma (May 11, 1896; Capitol View (May, 1899); Piney Point (July 17 and 20, 1889); Laurel (Aug. 2, 1889; Sept. 13 and 27, 1889); Aikin (Aug. 30, 1894).

Massachusetts.—Wayland (Sept. 17, 1879); Waltham (May 18, 1878); Great Island (July 14, 1891); Dorchester (Sept. 1 and 8, 1887); Brookline (June, 1872); Wareham (June 10, 1893); Cotuit (July 15, 1879); Marshfield (July 14, 1879); Cambridge; Princeton.

Michigan.—Palmer Park, Wayne County (May 26, 1907).

Minnesota.—Fort Snelling (May 22, 1890; June 4, 1891); Grant County (spring, 1877; May 20, 1876); Moorhead (Aug. 31, 1912: Sept. 28, 1912).

Missouri.—Charleston (May 8, 1879; May 6, 1878); Marble Cave, Stone County (June 30, 1892); Cushion Lake (May 6, 1909).

New Hampshire.—Hollis (July 27, 1886; May 26, 1876).

New Jersey.—Corona, Bergen County (Aug. 29, 1888); Mount Ephraim (Sept. 10, 1884); Cumberland County (Aug. 23, 1887); Cape May (May, 1842).

New York.—Baldwin, Long Island (Sept. 3, 1908); Good Ground, Long Island (July 3, 1884); New York (1871); Lake Grove (May 30, 1889); Hastings-on-Hudson (May 30, 1892); Shelter Island, Suffolk County (Oct. 15, 1897); Pocantico (May 19, 1891); Roslyn, Queens County (September, 1887).

North Carolina.—Fort Macon (June 10, 1869); Raleigh (Aug. 31, 1894); Weaverville (May 24, 1893).

North Dakota.—Pembina (June 16, 1873); Turtle Mountains (June 8, 1897); Stump Lake, Nelson County (Aug. 2, 1905).

Pennsylvania.—Carlisle (May 16, 1844; June 10, 1844); Chester County (June 2, 1894; Aug. 21, 1894); Chestnut Hill, Philadelphia (May 7, 1880; Sept. 10, 1878); Marple, Delaware County (May 23, 1881); Erie (May 18, 1889); Bethesda (July 13, 1896); Big Tink Pond, Pike County (Aug. 26, 1908).

South Carolina.—Ladys Island (May 12, 1869).

Tennessee.—Bellevue, Davidson County (May 23, 1895); Strawberry Plains.

Texas.—Brownsville (May 4, 1889); Corpus Christi (May 28 and 29, 1891).

Virginia.—Dunn Loring (Sept. 2, 1891); Arlington (Aug. 22, 1879); The Isaacs (May 24, 1899); Smiths Island (May 21, 1894; May 9 and 27, 1899; May 20, 1910; June 4, 12, 23, and 30, 1899); Gainesville (Aug. 25 and 29, 1887; Aug. 14, 1886).

West Virginia.—White Sulphur (July 8 and 19, 1898).

Wisconsin.—Camp Douglas (Aug. 12, 1891); Cassville (June 3, 1912); Lake Koshkonong (June 24, 1873; July 8, 1873).

Campeche.—La Tuxpana (Sept. 28, 1912).

Argentina.—Ysca Yacu, Province of Santiago (Jan. 31, 1906).

Costa Rica.—Rio Sicsola, Talamanca (Sept. 24, 1904); Miravalles (May 25, 1906).

Isle of Pines, West Indies.—Santa Fe (May 10, 1904).

Jamaica.—Spanishtown (September, 1863).

Measurements of specimens of Chordeiles virginianus virginianus.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Carnegie Mus. 9968.[1]	Male	Fauriel, Grosse Isle, Magdalen Islands, Quebec.	June 15, 1901	D. A. Atkinson.	195	110	6.5	14	15
U.S.N.M. 203989[1]	do	Digby, Nova Scotia.	July 14, 1907	W. H. Osgood.	192	113	6.3	15	14.5
U.S.N.M. 109917[1]	do	Hollis, N. H.	July 27, 1886	W. H. Fox.	201.5	112	6.2	14	15.2
Field Mus. N. H. 42089.[1]	do	Great Island, Mass.	July 14, 1901	C. B. Cory.	184	107.5	7	14.5	15
E. A. and O. Bangs 749.[1]	do	Waltham, Mass.	May 18, 1878	E. A. and O. Bangs.	208	118	7.5	14.3	14.5
Am. Mus. N. H. 65271.[1]	do	Good Ground, Long Island, N. Y.	July 3, 1884	W. Dutcher.	205	113.5	6.1	15	15.5
Am. Mus. N. H. 65274.[1]	do	Lake Grove, Long Island, N. Y.	May 30, 1889	do	194.5	107	6.1	15.2	14.7
M.C.Z. 38895[1]	do[2]	Pocantico, N. Y.	May 19, 1891	W. E. D. Scott.	205	111	6.2	14.8	15.5
U.S.N.M. 168712[1]	do	Slave River, 10 miles below Peace River, Alberta.	June 7, 1901	E. A. and A. E. Preble.	188	108	6.5	14	15
U.S.N.M. 169636[1]	do	Athabaska Lake, Alberta.	June 1, 1901	do	197.5	115	6.5	13.5	13
U.S.N.M. 153236[1]	do	Wayne Island, British Columbia.	Aug. 19, 1892	T. Collenson.	201	106	6.1	13.5	15
Mus. Vert. Zool. 15695.[1]	do	Errington, Vancouver Island, British Columbia.	Aug. 30, 1910	H. S. Swarth	204	109.5	7.5	15	15.5
U.S.N.M. 135353	do	Smiths Island, Va.	May 21, 1894	C. W. Richmond.	199.5	112.5	6.5	14.2	15.3
Carnegie Mus. 6365.	do	do	June 30, 1899	[P. M. Shufeldt.]	198	112	7.1	15	16
Carnegie Mus. 3943.	do	do	June 4, 1899	P. M. Shufeldt.	185	106.5	6	15.5	16.1
Carnegie Mus. 3941.	do	do	May 27, 1899	do	190	110	6.9	13.8	14.2
Carnegie Mus. 4229.	do	do	June 12, 1899	do	194	109.5	6.5	14.2	14.2
A. N. S. Phila. 43850.	do	Weaverville, N. C.	May 24, 1893	C. S. Cairns.	201.5	106	6	14.5	15.1
A. N. S. Phila. 45229.	do	Raleigh, N. C.	Aug. 31, 1894	H. H. and C. S. Brimley.	204.5	109	7.2	13.8	14.7
U.S.N.M. 203988[1]	Female	Digby, Nova Scotia.	July 13, 1907	W. H. Osgood.	198	106	6.5	14	15.5
Carnegie Mus. 30429.[1]	do	Brunswick House, Ontario.	June 9, 1908	M. A. Carriker, jr.	191.5	113.5	6.5	13.8	14
Carnegie Mus. 30347.[1]	do	do	do	W. E. C. Todd.	193	111	7	15	16
E. A. and O. Bangs 750.[1]	do	Marshfield, Mass.	July 14, 1879	E. A. and O. Bangs.	187.5	108.5	7.2	14.5	15
A. N. S. Phila. 47663.[1]	do	King and Bartlett Lake, Somerset Co., Me.	July 15, 1893	A. B. Van der Wielen.	200	118.5	6.3	15	15
A. N. S. Phila. 57396.[1]	do	Bethesda, Pa.	July 13, 1896	F. G. Meyers	196.5	108.5	6.2	15.5	16.3
A. N. S. Phila. 26711.[1]	do	Chestnut Hill, Philadelphia, Pa.	Aug. 1, 1878	W. L. Abbott.	193	105	7	14.6	15.6
A. N. S. Phila. 45215.[1]	do	Chester County, Pa.	June 2, 1894	H. Garrett.	199	118	6.9	15	16.5
Am. Mus. N. H. 81566.[1]	do	Erie, Pa.	May 18, 1889	G. B. Sennett.	203	117	6.9	15.1	15.1
Carnegie Mus. 3456.[1]	do	White Sulphur, W. Va.	July 8, 1898	T. Surber.	203	113.5	6.9	15	16
U.S.N.M. 57903	do	Fort Macon, N. C.	June 10, 1869	E. Coues.	197	112	7.1	15.9	16.2
U.S.N.M. 212719	do	Smiths Island, Va.	May 20, 1910	J. H. Riley.	194	109	6.5	14.9	15.7
Carnegie Mus. 3942.	do	do	June 4, 1899	P. M. Shufeldt.	181.5	108.5	.....	14.3	14.3
Carnegie Mus. 4231.	do	do	June 12, 1899	do	186	113	7	14.6	15
Carnegie Mus. 4230.	do	do	do	do	173.5	107.5	7.2	15	15.5
Carnegie Mus. 4232.	do	do	do	do	187.5	111	7.1	13	14.2
Carnegie Mus. 6364.	do	The Isaacs, Northampton Co., Va.	May 24, 1899	[P. M. Shufeldt.]	187.5	107	7	15	15.9

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[1] Used in measurement averages on p. 36.

[2] Specimen described on p. 35.

CHORDEILES VIRGINIANUS HESPERIS Grinnell.

Chordeiles virginianus hesperis GRINNELL, Condor, vol. 7, November 22, 1905, p. 170 (Bear Lake, San Bernardino Mountains, California).

Chars. subsp.—Similar to *Chordeiles virginianus virginianus*, but male with upper surface lighter, the ground color more brownish, the light markings more numerous, particularly on back, scapulars, tertials, and superior wing-coverts; the posterior lower parts less washed with buffy, and the dark bars averaging narrower.

Measurements.—Male: Total length (in flesh), 220.7–260.3 (average, 240.5) mm.;[1] extent of wing, 568.2–609.6 (588.9).[1]

Female: Weight, 4 ounces avoirdupois.[2]

Male:[3] Wing, 183–211 (average, 200) mm.; tail, 107–120 (112.9); exposed culmen, 6.0–8.0 (6.9); tarsus, 13.8–15.2 (14.3); middle toe, 14–15.5 (14.7).

Female:[4] Wing, 187–203 (194.9) mm.; tail, 105–119 (112.2); exposed culmen, 6.1–8.0 (7.0); tarsus, 13–15.2 (14.5); middle toe, 14.2–16 (15.3).

Type-locality.—Bear Lake, 6,700 feet altitude, San Bernardino Mountains, southern California.

Geographical distribution.—Extreme western United States and southern edge of southwestern Canada; south in winter, probably to South America. Breeds in the Upper Austral, Transition, and Canadian zones, north to Indian Head and Maple Creek, southern Saskatchewan; Many Island Lake, near Walsh, southeastern Alberta; Trail, southeastern British Columbia; and Fort Steilacoom, Puget Sound, northwestern Washington; west to Aberdeen, central western Washington; Astoria, Newport, and Glendale, western Oregon; Humboldt Bay and Ukiah, northwestern California; Auburn in Placer County, central California; and the Kern River Lakes and Santa Barbara, southwestern California; south to Venturia County, and to the South Fork of the Santa Ana River, and Fish Creek in the San Bernardino Mountains, southwestern California; east to Sugarloaf Peak in the San Bernardino Mountains, southwestern California; Furnace Creek in Death Valley, southeastern California; Mount Magruder, southwestern Nevada; Eureka, central Nevada; Fairfield, north central Utah; Promontory, central northern Utah; Blackfoot, southeastern Idaho; Upper Geyser Basin, in Yellowstone National Park, northwestern Wyoming; Bozeman, Great Falls, and the Bear Paw Mountains, central Montana; and Indian Head, central southern Saskatchewan. Migrates southward through Kansas, Colorado, Arizona, New Mexico, Texas, Mexico, and Nicaragua. Winters probably in South America.

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[1] Two specimens.

[2] One specimen.

[3] Ten specimens, from California, Oregon, and Montana.

[4] Ten specimens, from California, Oregon, and Idaho.

Remarks.—The female of this race differs in color from the male in her usually more buffy posterior lower parts; rather lighter, more brownish (less blackish) ground color of the upper surface, with light markings there averaging darker, duller, less sharply contrasted with the dark areas, and usually somewhat more ochraceous or brownish (less whitish). She is, in fact, more like *Chordeiles virginianus howelli*[1] than is the male. She is even more different from the female of *Chordeiles virginianus virginianus* than is the male from that form, being rather readily separable by her lighter, more brownish (less blackish), more heavily light-mottled upper parts, these light markings paler tawny or ochraceous; paler under surface, the dark brown areas less blackish, the tawny and ochraceous parts, including the throat, paler, the posterior portion more narrowly barred and less strongly tinged with buff or tawny.

The juvenal and first autumn plumages are distinguishable from the same stages of *Chordeiles virginianus virginianus* and *Chordeiles virginianus chapmani* by their lighter upper surface, the ground color of which is more brownish, the light markings usually somewhat more buffy and more numerous. Most specimens are, on the upper surface, very much like adult male *Chordeiles virginianus sennetti*, occasional birds almost indistinguishable, but are rather more brownish and buffy.

Individual variation in color is very marked, more so in the female than in the male. In the male the ground color of the lower parts is normally creamy white, varying to pure white and to cream buff; in the female normally cream buff, varying to cream white and to ochraceous buff, the light throat-patch ranging from ochraceous buff to buffy white. The upper surface of the male is normally blackish brown, with considerable light mottling, mostly of white and grayish white, with some buff. The general impression is lighter than in *Chordeiles virginianus virginianus*, darker than in *Chordeiles virginianus sennetti*. Sometimes it is more blackish, sometimes more brownish, and the mottlings are occasionally, at least in part, ochraceous buff. The upper surface of the female is normally as described above, but varies occasionally (No. 161983, U.S.N.M., Quincy, California, June 21, 1889) to dark grayish brown with extensive white, scarcely any buff, markings, practically as in typical male *Chordeiles virginianus sennetti;* to a more extensively blackish general color (No. 94978, U.S.N.M., Fort Klamath, Oregon, July 25, 1883), with few light markings, very much like the adult male *Chordeiles virginianus virginianus;* to a more rufescent brownish, though dark color (No. 19839, Carnegie Mus., Beaverton, Oregon, June 28, 1884), with nearly all the light markings buff, ochraceous, or tawny, very closely resembling the adult male of *Chordeiles virginianus henryi*; or even to a lighter brown, very much mottled (No. 6819, J. Grinnell, Bluff Lake, San Bernardino Mountains, California, July 22, 1905), like the male of *Chordeiles virginianus howelli*.

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[1] See p. 57.

As in *Chordeiles virginianus virginianus*, there is little or no geographical variation in this race. Breeding birds from southern California seem to be practically identical in both color and size with those from northern California, Idaho, western Montana, and other parts of the breeding range. Breeding birds from Nevada seem to be all *Chordeiles v. hesperis*, and identical with California specimens. One breeding example from the Hood River, Oregon (No. 156571, U.S.N.M., June 21, 1897), looks like *Chordeiles virginianus virginianus;* but others from North Dalles and Fort Steilacoom, Washington, from Heppner and the John Day River, Oregon, are surely *Chordeiles v. hesperis;* and while all the breeding birds available from Oregon and southern Washington are somewhat intermediate between *C. v. virginianus* and *C. v. hesperis*, they are much nearer the latter. A single specimen from the Milk River, at latitude 49°, Montana (No. 67646, U.S.N.M., July 24, 1874), others from the Sun River and elsewhere in western and central Montana, as well as southern Idaho, are practically indistinguishable from California examples of *Chordeiles virginianus hesperis*. One half-grown bird in juvenal plumage from the Upper Geyser Basin, Yellowstone National Park, northwestern Wyoming (No. 62256, U.S.N.M., Aug. 20, 1872), is apparently the present form, being much too grayish for *Chordeiles virginianus howelli*,[1] and too dark for *Chordeiles virginianus sennetti*. Breeding birds from Trail, southeastern British Columbia, close to the boundary of the State of Washington, verge toward *Chordeiles virginianus virginianus*, but are decidedly nearer *Chordeiles v. hesperis*. A series of breeding specimens from Maple Creek, southwestern Saskatchewan, and two individuals from Indian Head, Saskatchewan, incline somewhat toward *Chordeiles v. sennetti*, but are clearly the present form. Average measurements of breeding specimens from different parts of the range compare as follows:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Five males, from southern California	200	113.5	7.2	14.3	14.7
Five males, from Oregon and Montana	200	112.2	6.7	14.4	14.8
One male, from Utah	195	107.5	6.9	15	16
Five females, from southern California	194.1	112.5	6.9	14	15
Five females, from Oregon and Idaho	195.6	111.9	7	15	15.6
One female, from Utah	187	108	6.6	14.5	16.3

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[1] See p. 57.

Like *Chordeiles virginianus virginianus*, this nighthawk lingers late in the spring south of its breeding range. A single typical male taken at Johnson Lake, Valley County, Montana, June 3, 1910, and another obtained at Saratoga, southeastern Wyoming, June 7, 1911, are evidently both but transients. So are also one taken by Alex Wetmore at Greybull, in Bighorn County, central northern Wyoming, June 14, 1910, and another at the same locality on June 15 of the same year, for the breeding bird of this region is *Chordeiles virginianus howelli;* and, furthermore, Mr. Wetmore assures us that the species had first arrived in this valley only a few days previous, and appeared to be on the move. Likewise the autumn migration begins very early, sometimes, at least, by the middle of July, thus before the breeding season is over, as the following records of practically typical specimens indicate: One taken, July 14, 1909, at Winslow, Arizona, by C. Birdseye; one, August 3, 1904, at Tres Piedras, New Mexico; one, August 11, 1902, in the Huachuca Mountains, Arizona, by H. S. Swarth; one, August 18, 1909, at Tuba, Arizona, by E. W. Nelson; and another, September 1, 1908, in Buckskin Valley, Iron County, Utah, by W. H. Osgood.

It has been reported from Poway, San Diego County, California, during migration, but apparently not certainly from Lower California. Three specimens collected by Dr. C. W. Richmond on the Escondido River, 50 miles above Bluefields, Nicaragua (No. 128370, U.S.N.M., adult male, Sept. 17, 1892; No. 128371, U.S.N.M., adult male, Sept. 17, 1892; and No. 128373, juvenal male, Oct. 28, 1892), are apparently typical *Chordeiles virginianus hesperis*. The last one (No. 128373) is the example mentioned by G. K. Cherrie[1] as like the type of his new race, *Chordeiles virginianus aserriensis*, but darker. An adult female (No. 27101, Field Mus.) from Miravalles, Costa Rica, is certainly *Chordeiles v. hesperis*, although M. A. Carriker, jr., has recorded it as *Chordeiles virginianus virginianus*.[2]

This nighthawk breeds chiefly during June and July, sometimes as early as May 24; at Big Stick Lake, near Maple Creek, Saskatchewan, Dr. L. B. Bishop found eggs on July 19, 1906. According to Joseph Grinnell it breeds chiefly in the Canadian Zone, though also in the upper part of the Transition Zone, in the San Bernardino Mountains of southern California. In other localities, however, it nests regularly all through the Transition Zone and also in the Upper Austral Zone.

Specimens examined.—Specimens to the number of 120 have been seen, from the localities in the subjoined list:

Alberta.—Many Island Lake, near Walsh (July 13, 1906).

British Columbia.—Trail (June 13, 14, and 16, 1902).

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[1] Auk, vol. 13, April, 1896, p. 136.

[2] Ann. Carnegie Mus., vol. 6, 1910, p. 501.

Saskatchewan.—Indian Head (June 18, 1892); Maple Creek (June 14, 1905; June 5, 1906; July 4 and 30, 1906); Hay Creek, near Maple Creek (July 6, 1906); Big Stick Lake, near Maple Creek (July 19, 1906).

Arizona.—Tuba (Aug. 18, 1909); Winslow (July 14, 1909); Huachuca Mountains (Aug. 11, 1902).

California.—Fish Creek, San Bernardino Mountains, 9,000 feet altitude (June 15, 1905); Bluff Lake, San Bernardino Mountains, 7,500 feet altitude (July 21, 22, 24, and 25, 1905); Sugarloaf Mountain, San Bernardino Mountains, 7,500 feet altitude (Aug. 23, 1905); Bear Lake, San Bernardino Mountains, 6,700 feet altitude (July 30, 1905); South Fork of Santa Ana River, San Bernardino Mountains (6,200 feet altitude, July 2, 4, 7, and 8, 1906; 7,000 feet altitude, June 27, 1905); Troy Meadows, Sierra Nevada (Aug. 2, 1911); Trout Creek, Sierra Nevada, Tulare County (3,000 feet altitude, July 28, 1911; 6,000 feet altitude, July 30 and 31, 1911); Jackass Meadow, Sierra Nevada, Tulare County, 7,750 feet altitude (July 30, 1911); Parker Creek, Warner Mountains, 5,500 feet altitude (June 22, 1910); Squaw Mountain, Warner Mountains (July 20, 1910); Coppervale, Lassen County (June 15, 1906); Millford, Honey Lake (June 18, 1906); Quincy (June 21, 1889); Redding (June 17, 1883); Lake City (June 11, 1896); Mount Shasta (Aug. 4, 1883; July 29 and 31, 1904); Blue Canyon (June 9, 1882); Tulare Valley; Cisco (June 30, 1885); Furnace Creek, Death Valley (June 19, 1891).

Colorado.—Estes Park (Aug. 3 and 10, 1893).

Idaho.—Pocatello (June 10, 1911); Birch Creek (Aug. 4, 1890); Big Butte (July 9, 1890); Arco (nestling, July 25, 1890); Nampa.

Kansas.—Hamilton (Sept. 10, 1913).

Montana.—Milk River at 49° north latitude (July 24, 1874); Sun River (Aug. 10 and 24, 1867); Great Falls (July 20, 1890); Johnson Lake, Valley County (June 3, 1910); Bozeman (Aug. 9, 1888); Corvallis (July 7, 1910); Gold Creek, Powell County, 5,000 feet altitude (Aug. 26, 1910).

Nevada.—Big Creek Ranch at base of Pine Forest Mountains (June 16, 1909); Pyramid Lake (June 23, 1893; July 3, 1903); Virgin Valley, Humboldt County (June 3, 1909); Gardnerville (July 13, 1898); East Humboldt Mts. (Aug. 4, 1868); Carson (June 18, 1881).

New Mexico.—Tres Piedras (Aug. 3, 1904, J. H. Gaut).

Oregon.—Newport (June 16, 1901); Adel, Lake County (June 20, 1896); John Day River (June 21, 1899); Beaverton (June 28, 1884; June 21, 1890; July 3, 1890); Fort Klamath (July 25, 1883); Heppner (June 10, 1896); Lake Alvord (July 31, 1896); Hood River (June 21, 1897); Astoria (nestling, July 19, 1897); Crooked River, 20 miles southeast of Prineville (June 28, 1896); 7 miles northwest of Corvallis (July 22, 1898); 1 mile southeast of Corvallis (July 4, 1899).

Texas.—Brownwood (Aug. 25, 1888).

Utah.—Buckskin Valley, Iron County (two specimens, Sept. 1, 1908); Fairfield (June 21 and 27, 1890).

Washington.—North Dalles (Rockland) (July 3, 1897); Fort Steilacoom, Puget Sound (July 16, 1858).

Wyoming.—Stinking Creek (=Shoshone River) (June, 1860); Greybull (June 14 and 15, 1910); Saratoga (June 7, 1911); Upper Geyser Basin, Yellowstone National Park (Aug. 20, 1872).

Campeche.—La Tuxpana (Oct. 4, 1912).

Nicaragua.—Escondido River, 50 miles from Bluefields (Oct. 28, 1892; Sept. 17, 1892).

Measurements of specimens of Chordeiles virginianus hesperis.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
J. Grinnell 6917 [1]...	Male [2]...	Bear Lake (6,700 feet alt.), San Bernardino Mountains, Cal.	July 30, 1905	J. Grinnell..	205	116.5	8	14.5	15
J. Grinnell 6467 [1]...	...do....	Fish Creek (9,000 feet alt.), San Bernardino Mountains, Cal.	June 15, 1905	.....do......	198	113	7	14.5	15
J. Grinnell 6842 [1]...	...do....	Bluff Lake (7,500 feet alt.), San Bernardino Mountains, Cal.	July 24, 1905	.....do......	191.5	107	6.5	13.8	14
J. Grinnell 6860 [1]...	...do....	.....do..........	July 25, 1905	.....do......	207	120	7.5	14.2	15
Mus. Vert. Zool. 19910 [1].	...do....	Trout Creek (3,000 feet alt.), Sierra Nevada Mountains, Tulare County, Cal.	July 28, 1911	.....do......	198.5	111	7	14.5	14.5
J. Grinnell —— [1]...	...do....	Newport, Oreg...	June 16, 1901	B. J. Bretherton.	211	118.5	6.2	15.2	15.2
Mus. Vert. Zool. 8861.[1]	...do....	John Day River, Oreg.	June 21, 1899	Loye Miller.	205	115	6.6	14	14
Carnegie Mus. 19840.[1]	...do....	Beaverton, Oreg..	June 21, 1890	A. W. Anthony.	200	112.5	8	14.5	15.5
U.S.N.M. 140392 [1].	...do....	Heppner, Oreg...	June 10, 1896	E. A. Preble.	201	108	6	14.1	15
U.S.N.M. 228076 [1].	...do....	Corvallis, Mont...	July 7, 1910	B. Bailey...	183	107	6.5	14	14.2
U.S.N.M. 130394...	...do....	Fairfield, Utah...	June 21, 1890	V. Bailey...	195	107.5	6.9	15	16
Mus. Vert. Zool. 19911.[1]	Female.	Trout Creek (6,000 feet alt.), Sierra Nevada Mountains, Tulare County, Cal.	July 30, 1911	J. Grinnell..	187	110	6.5	14.2	15
Mus. Vert. Zool. 19912.[1]	...do....	.....do..........	.....do......	.....do......	193	113	7	14.5	16
J. Grinnell 7553 [1]...	...do....	South Fork Santa Ana River (6,200 feet alt.), San Bernardino Mountains, Cal.	July 4, 1906	.....do......	198	119	7	14.2	15
J. Grinnell 7549 [1]...	...do....	.....do..........	July 2, 1906	.....do......	196	112	6.5	13	15
J. Grinnell 6819 [1]...	...do....	Bluff Lake (7,500 feet alt.), San Bernardino Mountains, Cal.	July 22, 1905	.....do......	196.5	108.5	7.5	14	14.2
Carnegie Mus. 19841.[1]	...do....	Beaverton, Oreg..	July 3, 1890	A. W. Anthony.	191	110.5	7.3	14.8	15.5
Carnegie Mus. 19839.[1]	...do....	.....do..........	June 28, 1884	.....do......	202	113	8	15.2	16
U.S.N.M. 140393 [1].	...do....	Crooked River, 20 miles southeast of Prineville, Oreg.	June 28, 1896	V. Bailey...	197.5	115	6.9	15.2	16
U.S.N.M. 142224 [1].	...do....	Big Butte, Idaho.	July 19, 1890	C.P.Streator	203	116	6.8	14.8	14.8
U.S.N.M. 140407 [1].	...do....	.....do..........	.....do......	.....do......	194.5	105	6.1	15	15.5
U.S.N.M. 140395...	...do....	Fairfield, Utah...	June 27, 1890	V. Bailey...	187	108	6.6	14.5	16.3

[1] Used in measurement averages on p. 46.

[2] Type.

CHORDEILES VIRGINIANUS SENNETTI Coues.

[*Chordiles popetue*] *Sennetti* Coues, Auk, vol. 5, January, 1888, p. 37 (50 miles west of Pembina [sic], North Dakota; and Wharton County, Texas).

Chars. subsp.—Resembling *Chordeiles virginianus hesperis*, but upper surface of male lighter and more grayish, i. e., the dark brown ground color lighter and more grayish, the light markings finer, more numerous, and paler, more grayish or whitish (less ochraceous); general tone of lower surface lighter, the dark anterior portions more grayish, the bars on posterior portion narrower, sometimes interrupted.

Measurements.—Male: Total length (in flesh), 212.6–247.6 (average, 231.6) mm.;[1] extent of wing, 412.8–590.6 (541).[1]

Female: Weight, 2 ounces 4 drams to 3 ounces 3 drams avoirdupois[2] (average, 2 ounces 13.3 drams).

Male:[3] Wing, 186–213 (average, 198.3) mm.; tail, 101.5–112.5 (109.1); exposed culmen, 6.0–7.2 (6.9); tarsus, 13.5–15.8 (14.6); middle toe, 13.9–16 (15.3).

Female:[4] Wing, 175–201 (189.5) mm.; tail, 102.5–115 (108); exposed culmen, 6.0–7.5 (6.5); tarsus, 13.8–15.3 (14.7); middle toe, 14–16 (14.9).

Type-locality.—Fifty miles west of the Pembina Mountains, in central northern North Dakota.

Geographical distribution.—Central northern United States, probably south in winter to South America; breeds in the Upper Austral and Transition zones, north to Pembina, to Towner County, and old Fort Union, northern North Dakota; and Strater, northeastern Montana; west to Strater, Darnall's Ranch in Dawson County, and Fort Keogh, eastern Montana; and Uva, southeastern Wyoming; south to Uva, southeastern Wyoming; Rosebud, central southern South Dakota; Thomas County and Antelope County, north central Nebraska; Sioux City and Dickinson County, northwestern Iowa; east to Dickinson County, northwestern Iowa; Madison, southwestern Minnesota; and Pembina, northeastern North Dakota. Migrates through Kansas and eastern Colorado, and probably Central America. Winters probably in South America.

Remarks.—This is easily seen to be one of the palest races, and is characterized, particularly in the male, by the grayish cast of light and dark colors both above and below, as compared with the other forms. The broad light streaks on the nape, especially, are very light buff or even whitish, and the upper surface of the wings has much light gray and whitish with a minimum of buff. The male of this subspecies is readily distinguishable from *Chordeiles virginianus virginianus* by its much lighter upper surface, the dark ground color less blackish, more grayish brown, the light mottlings much more numerous, finer, paler, and less ochraceous (more whitish or grayish); and also by its lighter lower surface, the posterior portion white instead of more or less tinged with buff or cream color, and less heavily barred with blackish, and the dark brown of anterior portion more grayish.

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[1] Four specimens.
[2] Three specimens.
[3] Ten specimens, from South Dakota, North Dakota, Minnesota, and Montana.
[4] Ten specimens, from South Dakota and North Dakota.

The female is more brownish below on the dark areas than is the male, also more washed with buff on the posterior portion; above usually darker and with less white mottling, the dark areas slightly more brownish, the light markings duller, more brownish, or more tinged with buff or ochraceous (not so whitish), and thus not so sharply contrasted. She differs from the female of *Chordeiles virginianus virginianus* in much lighter, more grayish (less brownish) upper surface, with much more numerous light markings; and paler lower parts, the dark portions more grayish (less brownish), the light areas more whitish (less tawny or ochraceous), and posteriorly less heavily brown-barred. From the female of *Chordeiles virginianus hesperis* she may be distinguished above by the somewhat lighter, more grayish shade of the dark brown ground color, and more whitish (less ochraceous), and usually more numerous light markings, the cervical streaks particularly paler, less buffy; and below by her somewhat paler and more grayish general cast, and the less deeply buff-tinged and less heavily barred posterior portion.

The first autumn plumage is lighter above than that of any of the other races, so much so that no special comparison is necessary; the upper surface being of a pale silvery gray, finely vermiculated, and sometimes also spotted with black and dark brown—really a very beautiful bird. As in the adult there is, however, much individual variation; some specimens are much more coarsely vermiculated, and even blotched and streaked with black above; some examples have a pure gray cast, others have a decided tinge of buff both above and below.

The nestling is usually pure white or cream white below, and duller, buffy white, with dark gray markings above; but occasionally pale fawn color below, and fawn color with Prout's brown markings above.

Individual variation has about the same range in the female as in the male. The latter is normally pale above, with numerous light grayish or whitish mottlings, from which it varies in occasional examples to a bird much more extensively blackish above, with much less light mottling and practically not distinguishable from typical

Chordeiles virginianus hesperis. Such are No. 13473, L. B. Bishop, adult male, Stump Lake, North Dakota, August 4, 1905; and No. 26715, Academy of Natural Sciences of Philadelphia, adult female, Huron, South Dakota, July, 1881. Birds of this description may, however, almost always be separated from *Chordeiles virginianus hesperis* by their pale, lightly barred under surface. The other extreme is a bird which has the markings of the upper parts very whitish, numerous, and extensive (No. 26717, Acad. Nat. Sci. Phila., adult male, Huron, South Dakota, July, 1881). Another variation produces a bird in which most of the light markings on back, scapulars, pileum, and hind neck are buff, cream buff, or cream color (No. 19835, Carnegie Mus., adult male, Madison, Minnesota, June 4, 1891). In some examples the lower tail-coverts and the middle of abdomen are almost immaculate white. There is some variation also in the depth of the color and in the width of the dark brown bars on the posterior lower parts. As may be seen from the table of measurements, this form varies greatly in size, apparently more so than some of the other races. A single adult female (No. 1960, collection of L. B. Bishop), from Towner County, North Dakota, taken June 11, 1895, is very brownish, and ochraceous or buffy both above and below, and is practically indistinguishable in appearance from very typical female *Chordeiles virginianus howelli*, thus strikingly different from any of the females of *Chordeiles virginianus sennetti* examined. It is, of course, just possible that this individual wandered northward from the range of *Chordeiles virginianus howelli*,[1] but it seems better to regard it as an abnormal variation of *Chordeiles virginianus sennetti*.

This subspecies has a more restricted distribution than most of the others. The birds from Huron, South Dakota, and from eastern South Dakota and eastern North Dakota in general are most typical, in that they carry to the extreme the characters of the subspecies; and the type of this race, from 50 miles west of the Pembina Mountains, is practically the same as these. Specimens representing the breeding bird of Dickinson County, Iowa, and Madison, western Minnesota, verge toward *Chordeiles virginianus virginianus*, but are much nearer the present race. Examples from Strater, and from Darnall's Ranch, Dawson County, in northeastern Montana, are darker above, and very close to *Chordeiles virginianus hesperis*, but are, as a whole, nearer *Chordeiles v. sennetti*. A single specimen (No. 171803, U.S.N.M., June 3, 1889) from Fort Keogh, central eastern Montana, seems to incline a little toward *Chordeiles virginianus howelli*,[1] in its more brownish and ochraceous colors above. Females from Towner County, North Dakota, are apparently darker on the upper surface than the females from farther south, but the males from the corresponding localities do not seem to differ. Two birds shot on Washington Creek, Kansas, September 12, 1908, identified and recorded[1] by Alex Wetmore, constitute one of the two authentic records for Kansas. Strangely enough, however, *Chordeiles virginianus sennetti* has apparently not a single record for Texas, although it almost certainly migrates through this State; since all the alleged instances of its occurrence there, so far as we have been able to determine, prove to be misidentifications of *Chordeiles virginianus howelli*[2] or *Chordeiles virginianus aserriensis*.[3] Nothing definite is known concerning its winter home, but this is presumably South America.

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[1] See p. 57.

This race, like most of the others, rears but one brood a year—in June or July. There are records of eggs from Miner County, South Dakota, as early as June 6 (1894); and from Towner County, North Dakota, as late as June 30 (1895); while we have seen nestlings from Devils Lake, taken on July 18 (1901).

The Sennett nighthawk was first described by Dr. Elliott Coues[4] in the following language:

> 2. **Sennetti**, large, silvery grayish-white predominating above, the white below greatly in excess of the narrow, irregular or broken, dark bars, and little or no rufous anywhere. *Hab.* Dakota to Texas, in any treeless country. Types 65,490, Mus. Smiths. Inst., formerly 3301, Mus. E. C., 50 miles west of Pembina, Minn., July 16, 1873, and 4927, Coll. George B. Sennett, Wharton Co., Texas, May 27, 1887.

Each of the specimens mentioned as types bears on the back of its label this legend, in the handwriting of Doctor Coues: "A type of the species Elliott Coues." The first example, which is now in the United States National Museum, has commonly received the distinction of being the type, but its correct locality is not "50 miles west of Pembina," as Coues and subsequent authors give it; but "50 miles west of Pembina Mts.," as the original label, in Doctor Coues' own well-known chirography, shows. This specimen is an adult male in worn summer plumage, of large size—that is, as big as *Chordeiles virginianus virginianus*, and of pale gray coloration, like the breeding birds of North Dakota and South Dakota; in fact, a good representative of the race that passes current under the name *Chordeiles virginianus sennetti*. The alleged type specimen from Wharton County, Texas, which is now in the American Museum of Natural History, in New York, is, however, a typical breeding bird of the *small*, more buffy, though pale, form of southern Texas, which we hereinafter separate as *Chordeiles virginianus aserriensis*.[3] Since this example does not, consequently, agree with the original diagnosis, and since the specimen first mentioned, from 50 miles west of the Pembina Mountains, does so agree, the latter must stand as the type.

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[1] Condor, vol. 11, 1909, p. 159.
[2] See p. 57.
[3] See p. 71.
[4] Auk, vol. 5, January, 1888, p. 37.

Specimens examined.—Seventy-seven specimens have been available, from the localities that follow:

Colorado.—Barr (Aug. 8, 1910).

Iowa.—Dickinson County (June, 1881); 4 miles southeast of Boone (Oct. 27, 1898).

Kansas.—Burlington (October, 1891); Hamilton (Sept. 17, 1913).

Minnesota.—Madison (May 25 and 28, 1891; July 4 and 18, 1891); Grant County (spring, 1877); Kimbrae (Sept. 13, 1897).

Montana.—Fort Keogh (June 3, 1889); Darnall's Ranch, Dawson County, 30 miles south of Glasgow (July 8, 1910); Strater, Valley County (July 16 and 18, 1910).

North Dakota.—Fort Union (July 1, 1843); 50 miles west of the Pembina Mountains (July 16, 1873); Fort Rice (June 18, 1873); Pembina (June 13, 1873—parent of eggs); Linton (June 27, 1912); Big Muddy Creek (July 2, 1873); Towner County (June 1, 1895; June 7, 1895; June 11, 1895; June 30, 1895; July 8, 1895; July 17, 1895; July 31, 1896); Rock Lake, Towner County (July 7, 1905); Devils Lake Indian Reservation (July 22, 1905); Tellers Bay, Devils Lake (July 18, 1901); Wolford, Pierce County (July 20, 1905); Turtle Mountain, Rolette County (July 6, 1902); Ottofy, Nelson County (June 19, 1905); Adler, Nelson County (July 31, 1902; Aug. 12, 1901); Stump Lake, Nelson County (June 22, 1905; July 21, 1902; July 26, 1902; Aug. 2, 1902; Aug. 4, 1905; Aug. 9, 1901; Aug. 14, 1905); Souris River (Sept. 3, 1873); Kenmare (July 15, 1913); Sentinel Butte (June 7, 1913); Glenullin (July 9, 1913); Bismarck.

South Dakota.—Huron (July, 1881); near Rosebud (Aug. 14, 1911); Missouri River 40 miles above Fort Pierre (June 30, 1856).

Wyoming.—Little Medicine (Aug. 4, 1899); Uva (July 6, 1909).

Measurements of specimens of Chordeiles virginianus sennetti.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
A.N.S.Phila.26720	[Male] ..	Huron, S. Dak ...	July —, 1881	W.L.Abbott	204	112.5	7	15.8	16
A. N. S. Phila.[1] 26717.[1]	...do.....	.....do............	.....do.......	.....do.......	213	112.5	7.1	15.1	15.9
A. N. S. Phila. 26718.[1]	...do.....	.....do............	.....do.......	.....do.......	186	101.5	7.1	14.8	14.8
Am. Mus. N. H. 43843.[1]	Male....	Fort Union, N.Dak	July 1, 1843	J.J.Audubon	192.5	108	7	14.9	15.2
U.S.N.M. 171803[1] ..	...do.....	Fort Keogh, Mont.	June 3, 1889	P.M.Thorne	199	111.5	7	13.5	15.5
U.S.N.M. 65294[1] ..	...do.....	Fort Rice, N.Dak.	June 18, 1873	....	195	106.5	6	14	14.3
U.S.N.M. 65490[1] ..	...do.[2]...	50 miles west of Pembina Mountains, N. Dak.	July 16, 1873	E. Coues....	194	111	7	14.9	16
U.S.N.M. 127570[1] ..	...do.....	Madison, Minn....	June 18, 1891	A. Lano.....	198	111	7	14.5	15.2
Carnegie Mus. 19834.[1]	...do.....	.....do............	.....do	[A. Lano]...	199	104.5	6.8	13.9	13.9
Carnegie Mus. 19835.[1]	...do.....	.....do............	June 4, 1891	.....do	202	112	7.2	14.5	16
A. N. S. Phila. 26715.[1]	[Female]	Huron, S. Dak ...	July —, 1881	W.L.Abbott	189	104	6.8	14.8	15

[1] Used in measurement averages on p. 52.

[2] Type.

Measurements of specimens of Chordeiles virginianus sennetti—Continued.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
A. N. S. Phila. 26716.[1]	[Female]	Huron, S. Dak....	July —, 1881	W.L.Abbott	183	107	6.9	13.8	14
A. N. S. Phila. 63941.[1]	Female .	Pembina, N. Dak.	June 13, 1873	E. Coues....	192.5	110	6.1	15	16
L. B. Bishop 7882[1].	...do.....	Adler, Nelson Co., N. Dak.	July 31, 1902	L. B. Bishop	198.5	110.5	6.5	14.5	15
L.B.Bishop 13084[1]	...do.....	Stump Lake, Nelson Co., N. Dak.	June 22, 1905	.....do.......	197	107	6	15	15.8
L.B.Bishop 7797[1].	...do.....	.....do............	July 26, 1902	.....do.......	177	102.5	6.5	14	14
L.B.Bishop 7798[1].	...do.....	.....do............	.....do.......	.....do.......	194	111	6	15	14.2
L.B.Bishop 6248[1].	...do.....	.....do............	Aug. 9, 1901	.....do.......	201	115	7	15.3	15.2
L.B.Bishop 2030[1].	...do.....	Towner Co., N. Dak.	June 30, 1895	.....do.......	187	109	6	15	15
L.B.Bishop 2952[1].	...do.....	.....do............	July 31, 1896	E. T. Judd ..	175.5	104	7.5	14.8	15

CHORDEILES VIRGINIANUS HOWELLI,[2] new subspecies.

Chars. subsp.—Somewhat like *Chordeiles virginianus sennetti*, but male with upper parts more rufescent and somewhat paler, the dark brown ground color more rufescent, less grayish, and the light markings much more buffy or ochraceous; posterior lower parts more buffy, and the anterior dark brown areas more rufescent.

Description.—Type, adult male, No. 186731, U.S.N.M.; Lipscomb, Texas, June 25, 1903, Arthur H. Howell; original number, 105. Upper parts brown, between hair brown and clove brown, much spotted, mottled, and irregularly and brokenly barred, so that comparatively little of the ground color remains, with brownish white, light brown, buff, and ochraceous, least numerously on the pileum, most coarsely on the scapulars, and in the form of broad irregular and broken bars on the upper tail-coverts, and of a more or less observable collar of broad buff and ochraceous buff streaks on the hind neck; tail brown like the ground color of upper parts, crossed by about 7 wide, irregular and broken bars, one of which is terminal on only the middle pair of rectrices, these bars light hair brown or whitish, and widest on the middle pair of feathers, and all the rectrices but the two middle ones with a broad subterminal band of pure white; wing-quills brown like the tail, the outer five primaries crossed by a very broad band of pure white posteriorly to the tip of the ninth primary (counting from the outermost); secondaries and inner primaries tipped with brownish white; outer half or more of the inner webs of secondaries and inner primaries with cream white or buff bars, those on primaries broken or obsolescent; the tertials mottled with light brown, brownish white, and buffy white, in the form of broad but much broken and obsolescent bars; superior wing-coverts brown like the wing-quills, the primary coverts with a few buff and brownish white spots, chiefly on inner webs, the others heavily spotted and mottled, in many places confluently, with cream white, brownish white, and buff, these light markings forming on the median and distal lesser coverts a conspicuous and almost solid patch; moustachial stripe and sides of head and neck dark brown like the ground color of upper parts, the subocular, postocular, and auricular regions, together with the sides of neck, conspicuously, the last-mentioned broadly, streaked with ochraceous buff and tawny ochraceous, the moustachial stripe much spotted and streaked with ochraceous buff and light tawny ochraceous; an ill-defined superciliary stripe consisting of spots and streaks of whitish and buffy, posteriorly confluent with the light streaks on the side of the neck and on the cervix; lores mostly white, somewhat mixed, particularly on lower portion, with fine markings of dark brown; chin white, washed with buff, finely streaked, and somewhat spotted with dark brown; broad gular crescent pure white; jugulum and upper breast sepia, the former heavily spotted with tawny, the latter spotted, streaked, and barred with creamy white, brownish white, cream buff, and buff; remainder of inferior surface cream white, barred with sepia, most thickly on lower breast, least thickly but more widely on lower tail-coverts; under wing-coverts dark brown like the wings, heavily barred with white, cream white, buff, and ochraceous buff; axillars cream color, barred with dark brown; edge of wing along the alula white.

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[1] Used in measurement averages on p. 52.

[2] Named for my friend Mr. Arthur H. Howell, who collected the type specimen.

Iris dark brown; bill black; feet gray.

Measurements.—Male: Total length (in flesh), 235 mm.;[1] extent of wing, 565.2.[1]

Female: Total length (in flesh), 228.6–254 (average, 239.3);[2] extent of wing, 558.8–590.6 (577.9).[2]

Male:[3] Wing, 192.5–211 (average, 200) mm.; tail, 105–121 (112.3); exposed culmen, 5.9–7.0 (6.3); tarsus, 13–15.2 (14.3); middle toe, 14.2–15.5 (14.9).

Female:[4] Wing, 185–203.5 (193.4) mm.; tail, 104–122.5 (112.8); exposed culmen, 6.5–7.2 (6.9); tarsus, 13–14.8 (14.2); middle toe, 14.6–16 (15.3).

Type locality.—Lipscomb, northwestern Texas.

Geographical distribution.—Central portion of western United States; south in migration through Central America, probably to South America. Breeds in the Lower Austral, Upper Austral, Transition, and Canadian zones, north to the Republican River, central northern Kansas; southwestern Nebraska; Wray and Loveland, northeastern Colorado; Laramie Peak, southeastern Wyoming; Greybull and Germania in Bighorn County, northwestern Wyoming; west to Germania and Fort Bridger, western Wyoming; and Parley's Park, Wasatch Mountains, central northern Utah; south to the Uinta Mountains, northeastern Utah; Grand Junction, central western Colorado; Twin Lakes, central Colorado; the Rio Grande and Trinidad, central southern Colorado; Sierra Grande and Cuervo, northeastern New Mexico; Hereford and Lamb County, northwestern Texas; San Angelo and Giddings, central Texas; east to Giddings, central Texas; Terrell and Bonham, central northern Texas; Lawton, central southern Oklahoma; Cairo, Hamilton, Turkey Creek, and the Republican River, middle Kansas. Migrates through eastern Mexico and Central America, and casually east to Grant County, southwestern Minnesota, and Warsaw, western Illinois. Winters probably in South America.

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[1] One specimen.

[2] Three specimens.

[3] Ten specimens, from Kansas, Texas, Colorado, Utah, and Wyoming.

[4] Ten specimens, from Kansas, Colorado, Wyoming, New Mexico, and Utah.

Remarks.—The male of this new race differs from that of *Chordeiles virginianus henryi* in lighter upper surface, particularly on the scapulars and tertials, the dark areas being more brownish (less blackish) and the light markings finer and usually much less deeply tawny or ochraceous; and in the lighter lower surface, which is less deeply buffy on posterior portion and less rufescent on the anterior part. From *Chordeiles virginianus hesperis* he may readily be distinguished by his much paler upper parts, the dark brown areas less blackish, the light mottlings much more numerous; and by the paler, anteriorly less rufescent, posteriorly more buffy, and more narrowly or brokenly barred lower surface. He is so very different from *Chordeiles virginianus virginianus* by reason of his much paler, more brownish, and much more numerously ochraceous- and buffy-marked upper parts; lighter, less blackish (more brownish) anterior lower surface; and lighter, less heavily barred breast and abdomen, that he is distinguishable almost at a glance.

The female is usually more brownish, decidedly more mottled with ochraceous on the upper parts, and much more buffy below than is the male. This makes the female more closely resemble the female of *Chordeiles virginianus henryi* than the male does the male of *Chordeiles v. henryi*, but she nevertheless is separable from the female of *Chordeiles v. henryi* by her lighter, more rufescent (less blackish) brown upper parts, with paler, usually finer and more numerous markings; and by the lighter jugulum (both as regards the ground color and the tawny and buff markings), throat, and posterior lower parts. From the female of *Chordeiles virginianus sennetti* she may be distinguished on the upper parts by her much more brownish (less grayish) and lighter ground color, and much more ochraceous light markings; and below by the more rufescent, less grayish, hue of the dark brown areas, the more ochraceous, tawny, or buff light parts, and the rather more weakly and brokenly barred abdomen. Compared with female *Chordeiles virginianus hesperis*, she is paler above, the dark areas being more brownish (less blackish or grayish), the light markings more numerous and more generally tawny or ochraceous (less whitish), so that the general effect is more rufescent; she is also lighter below, the dark areas, particularly the jugulum, more rufescent, the throat and other light portions anteriorly averaging more deeply tawny or ochraceous, posteriorly nearly always much more deeply and extensively buff, with lighter dusky bars.

The first autumn plumage is somewhat similar to that of *Chordeiles virginianus hesperis*, but is very much lighter above—is, in fact, the lightest of all the races excepting *Chordeiles virginianus sennetti*—more extensively mottled, the dark markings greatly reduced; also on the light areas more ochraceous or buffy, and on the dark portions more brownish (less blackish). It differs from the first autumn plumage of *Chordeiles virginianus sennetti* in its darker, more ochraceous or buffy upper parts, and less finely and closely vermiculated throat and jugulum.

Individual variation in this subspecies is about as great as in *Chordeiles virginianus hesperis*. The normal coloration of the male is fairly represented by the type described above. Occasionally the upper parts are much more extensively light-mottled, so much so that the dark ground color is almost obscured, as in No. 38316, U.S.N.M., adult male, Laramie Peak, Wyoming, June 9, 1864. The other extreme shows in No. 43846, Amer. Mus. Nat. Hist., adult male, Fort Bridger, Wyoming, June 22, 1858, in which the upper parts are much less heavily mottled, and the light markings more whitish, pale brownish or buffy (less ochraceous), thus giving the center of the back and the upper surface generally a more blackish aspect. Such birds are much like some specimens of *Chordeiles virginianus hesperis*, but are distinguishable by their more brownish cast above, and by their more creamy or buffy posterior lower parts. Rarely, as in No. 43531, Mus. Comp. Zoöl., adult male, Fort Bridger, Wyoming, June 22, 1858, the light markings of upper surface are more whitish, in which case the bird very much resembles *Chordeiles virginianus sennetti;* but the more brownish upper parts and more creamy or buffy ventral surface will serve to distinguish such specimens. The ground color of the posterior lower parts in the male is occasionally almost pure white, usually cream color or buff, sometimes cream buff. The female varies even much more than the male. One extreme is observable in specimens such as No. 166920, U.S.N.M., adult female, Henrietta, Texas, July 30, 1900, and No. 43530, Mus. Comp. Zoöl., Fort Bridger, Wyoming, June 21, 1858, which have dark, dull, blackish brown upper parts, with but sparse ochraceous, whitish or dull light brown mottlings, especially on the back, in which respect they are somewhat like *Chordeiles virginianus hesperis*, though more brownish, and which have also the breast and jugulum mostly dark brown with some buff or ochraceous buff spots, and the posterior lower parts whitish or pale buff. The other extreme is to be seen in birds like No. 19078, U.S.N.M., adult female, Antelope Hills, 150 miles west of Fort Cobb, Oklahoma, June 7, 1860, and No. 94693, U.S.N.M., Colorado Springs, Colorado, June 24, 1883, in which the upper parts are, in general effect, very tawny, much as in *Chordeiles virginianus henryi*, though paler, with the light markings above numerous and all tawny or tawny ochraceous; the throat and jugulum are mostly tawny and tawny ochraceous; and the posterior lower surface deep buff.

That three well-defined subspecies have hitherto been included under the name *Chordeiles virginianus henryi* is shown very plainly by the material available for the present investigation. One of these, to which the name *Chordeiles virginianus henryi*[1] is applicable, is a large, rather dark, very rufescent or tawny bird, and occupies, during the breeding season, the greater part of New Mexico and Arizona; another, a small, pale, and rather grayish bird, summers chiefly in southern Texas, and to this the name *Chordeiles virginianus aserriensis*[2] seems to apply; while the third is the large, light-colored buffy or ochraceous race, which ranges in summer from Wyoming and Colorado to Kansas and central Texas, and which I have above named *Chordeiles virginianus howelli*.

The geographical area occupied by *Chordeiles virginianus howelli* lies between the ranges of *Chordeiles virginianus hesperis* and *Chordeiles virginianus aserriensis*,[2] on the one hand, and between *Chordeiles virginianus sennetti* and *Chordeiles virginianus henryi*, on the other; and it is to a certain degree intermediate also in colors; but notwithstanding this, it presents characters that are fairly uniform over practically all of its range, except, of course, along the very edges of its distribution, where it passes into the surrounding forms of the species; and it is, on the whole, as the subspecies of *Chordeiles virginianus* go, a readily recognizable race. Birds from Fort Hays and Cairo, in middle Kansas, are not different from those of Colorado and southern Wyoming; and those from the southern part of Colorado, in the Rio Grande Valley, seem to be just like those from other parts of the same State—

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[1] *Chordeiles henryi* Cassin, Illustr. Birds Cal., Texas, Ore., Brit. and Russ. Amer., vol. 1, 1855, p. 239 (Fort Webster, N. Mex.).

[2] Cherrie, Auk, vol. 13, April, 1896, p. 136. See also p. 73.

that is, typical. Specimens from Germania, Greybull, and other localities in northern Wyoming are darker above, thus verging somewhat toward *Chordeiles virginianus hesperis*, though still much too pale and brownish above for that form. Examples from southeastern Wyoming show some tendency toward intergradation with *Chordeiles virginianus sennetti*. The few individuals from Henrietta in central northern Texas examined are in color typical *Chordeiles virginianus howelli*, but in size appear to be smaller, in this showing a close approach to *Chordeiles virginianus aserriensis*[1] of southern Texas; but the small series and the worn and otherwise poor condition of the specimens may be responsible for at least part of the difference. Birds which apparently represent the breeding form of Lee County, Texas, considerably farther south and near the known breeding range of *Chordeiles virginianus aserriensis*,[1] are, however, larger, while those from northwestern Texas are of full size. The differences in size that obtain in birds from the various parts of the breeding range of the present race are observable in the following average measurements:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Ten males, from Wyoming, Utah, Colorado, Kansas, and northwestern Texas	200	112.3	6.3	14.3	14.9
Two males, from central northern Texas	186	104.3	7	14.5	14.8
Ten females, from Wyoming, Utah, Kansas, northeastern New Mexico, and northeastern Colorado	193.4	112.8	6.9	14.2	15.3
One female, from central southern Colorado	195	118	6.8	13.8	14.2
Two females, from central northern Texas	180.3	104.5	7	14.3	14.6

One adult male from Warsaw, Illinois (No. 98226, U.S.N.M.), taken, May 20, 1884, and another from Grant County, Minnesota (No. 81564, Amer. Mus. Nat. Hist.), collected in the spring of 1877, seem to be both practically typical *Chordeiles virginianus howelli*, though apparently far out of the normal migration route of this form, and thus of merely casual occurrence here. The present race undoubtedly migrates regularly through Mexico and Central America to South America, but there is only one certain record of its occurrence south of the United States: a single individual from the Escondido River, in Nicaragua, 50 miles above Bluefields, taken, September 17, 1892, by Dr. Charles W. Richmond.

The specimen (No. 6696, U.S.N.M.) that Prof. Spencer F. Baird regarded as the type of *Chordeiles virginianus henryi* Cassin is still in the United States National Museum. The face of its label is as follows:

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[1] See p. 71.

Pacific R. R. S. Near 38° L. Lt. E. G. Beckwith, U. S. A.
6696 Chordeiles henry
Rio Grande Valley Kreutzfeldt 10

On the reverse side is the word "type" in Professor Baird's handwriting. This specimen was really taken in the San Luis Valley near 38° north latitude, in central southern Colorado, where Lieutenant Beckwith's expedition is known to have traveled. Professor Baird recorded this specimen as the type of *Chordeiles virginianus henryi*,[1] but, possibly by typographical error, gave it the wrong number (6690);[1] and on the following page,[2] in the "List of specimens," still another erroneous number (6698). This example is, however, not the real type of *Chordeiles virginianus henryi*, which came from Fort Webster, New Mexico, as we shall fully explain under that form,[3] and Professor Baird in considering it such was evidently under misapprehension regarding the specimen on which Mr. Cassin based his description of *Chordeiles henryi*.[4] This *supposed* type is a female, in juvenal plumage, though full grown, with spotted throat and much mottled upper surface, and is undoubtedly an example of the present race, *Chordeiles virginianus howelli*.

Specimens examined.—I have examined 106 examples of this new race, from the localities below:

Colorado.—Loveland (July 23, 1895); Rio Grande (June 10, 13, and 15, 1873); Colorado Springs (June 24, 1873); Barr (June 4, 1910); Wray (May 21, 1909); San Luis Valley, near 38° north latitude; Denver (July 7, 1888); mountains west of Denver.

Illinois.—Warsaw (May 20, 1884).

Kansas.—Fort Hays (June 3, 6, 7, 8, 10, and 12, 1871); Republican River (May 24 and 26, 1864); Republican River, 70 miles west of Fort Riley (June 30, 1857); Turkey Creek (July 21, 1857); Cairo (July 29, 1892); Hamilton (July 11 and 17, 1913; Sept. 10, 1913).

Minnesota.—Grant County (spring, 1877).

New Mexico.—Socorro (Aug. 15, 1909, E. A. Goldman); Cuervo (June 13, 1903, V. Bailey); Cantonment Burgwyn (Sept. 2, 1859); Sierra Grande (Aug. 17, 1903).

Oklahoma.—Antelope Hills, 150 miles west of Fort Cobb (June 7, 1860); Lawton (June 30, 1905); Chattanooga (July 4, 1905).

Texas.—Henrietta (July 30 and 31, 1900; Aug. 18, 1892; Aug. 1

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[1] Rep. Explor. and Surv. R. R. Pac., vol. 9, 1858, p. 153.

[2] Idem, p. 154.

[3] See pp. 68–69.

[4] Cassin, Illustr. Birds Cal., Texas, Ore., Brit. and Russ. Amer., vol. 1, 1855, p. 239.

and 3, 1900); Mobeetie (July 23, 1903); Corpus Christi (Oct. 22, 1909; May 21, 24, and 28, 1891; April 22, 1889; April 21 and 24, 1891); San Antonio (April 16, 1889; May 31, 1891); Dallas; Lipscomb (June 25, 1903); Giddings (May 12 and 17, 1887; June 7, 1887); Lee County (May 26, 1888); Rio Grande City (May 1, 1889).

Utah.—Parley's Park, Wasatch Mountains (June 21, 1869; July 24, 1869; Aug. 13 and 16, 1869).

Wyoming.—Fort Bridger (June 16, 19, 21, and 22, 1858); Laramie Peak (June 4, 6, 9, and 21, 1864); Greybull (June 15 and 20, 1910); La Bonte River (Aug. 8, 1858); Riverside (June 9, 1911); Bridger Pass (Aug. 13, 1856); Germania (June 23, 1910); Dry Creek, near Germania (June 22, 1910); Bitter Creek (Aug. 1, 1895); Laramie River (Aug. 27, 1876); Arvada (Aug. 21, 1913).

Campeche.—La Tuxpana (May 8, 1913).

Nicaragua.—Escondido River, 50 miles from Bluefields (Sept. 17, 1892).

Measurements of specimens of Chordeiles virginianus howelli.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Am. Mus. N. H. 43846.[1]	Male....	Fort Bridger, Wyo.	June 22,1858	C. Drexler...	196	110.5	6	13.8	15.8
U.S.N.M. 10801 [1]..	...do.....	.....do............	June 19,1858	.....do.......	211	121	6	14	15.5
U.S.N.M. 58536 [1]..	...do.....	Parley's Park, Wasatch Mountains, Utah.	June 21,1869	R. Ridgway.	202.5	114.5	6.8	13	14.5
U.S.N.M. 84253 [1]..	...do.....	.....do............	July 24,1869	.....do.......	202.5	111	6.5	14.7	15.2
U.S.N.M. 186731 [1].	...do.[2]...	Lipscomb, Tex...	June 25,1903	A. H. Howell	203	111	6.3	15	15
U.S.N.M. 186749 [1].	...do.....	Mobeetie, Tex....	July 23,1903	.....do.......	192.5	105	6.5	14.6	14.6
U.S.N.M. 140391 [1].	...do.....	Loveland, Colo...	July 23,1895	E. A. Preble	202	116.5	6	14	14.2
M.C.Z. 15313 [1].....	...do.....	Fort Hays, Kans.	June 6,1871	....	192.5	108.5	5.9	14	15
M.C.Z. 15337 [1]	...do.....	.....do............	June 7,1871	....	197	110	6	14.2	14.2
U.S.N.M. 142225 [1].	[Male]...	Cairo, Kans........	Aug. 29,1892	V. Bailey...	201	115	7	15.2	15.2
U.S.N.M. 166921..	Male....	Henrietta, Tex...	July 31,1900	H. C. Oberholser.	181	102.5	7	14.5	15
U.S.N.M. 166923..	...do.....	.....do............	Aug. 3,1900	.....do.......	191	106	7	14.5	14.5
U.S.N.M 84254 [1]...	Female..	Parley's Park, Wasatch Mountains, Utah.	Aug. 16,1869	R. Ridgway.	194	117	6.5	13	16
U.S.N.M. 186945 [1].	...do.....	Sierra Grande, N. Mex.	Aug. 17,1903	A.H.Howell.	193	108	7.2	14.5	15.5
U.S.N.M. 10824 [1]..	...do.....	Fort Bridger, Wyo.	June 19,1858	C. Drexler..	193.5	108.5	6.8	13	15.5
Am. Mus. N. H. 43844 [1].	...do.....	.....do............	.....do.......	.....do.......	203.5	122.5	6.8	14.8	14.8
M.C.Z. 43530 [1].....	...do.....	.....do............	June 21[1858]	[C. Drexler].	200	117.5	7	14	15.5
M.C.Z. 43531 [1].....	...do.....	.....do............	June 22[1858]	.....do.......	185	108.5	7	14.8	15
M.C.Z. 15308 [1].....	...do.....	Fort Hays, Kans.	June 3,1871	....	198.5	120	7.2	14.7	15.8
M.C.Z. 15314 [1].....	...do.....	.....do............	June 6,1871	....	192.5	116	7	14.8	15
M.C.Z. 15359 [1].....	...do.....	.....do............	June 8,1871	....	186.5	104	7	14	14.6
U.S.N.M. 205972 [1]..	...do.....	Wray, Colo........	May 21,1909	M. Cary.....	187.5	106	6.9	14.2	15.1
U.S.N.M. 6696 [3]...	Female [juv].	Rio Grande Valley [i. e., San Luis Valley], near N. Lat. 38°, Colo.	....	Mr. Kreuzfeldt.	195	118	6.8	13.8	14.2
U.S.N.M. 166920..	Female	Henrietta, Tex...	July 30,1900	H. C. Oberholser.	186	106	6.5	15	15
U.S.N.M. 166922..	...do.....	.....do............	Aug. 1,1900	...do.........	174.5	103	7.5	13.5	14.2

[1] Used in measurement averages on p. 58.

[2] Type.

[3] Supposed type of *Chordeiles virginianus henryi* (see pp. 62-63).

CHORDEILES VIRGINIANUS HENRYI Cassin.

Chordeiles henryi CASSIN, Illust. Birds Cal., Texas, Ore., Brit. and Russ. Amer., vol. 1, 1855, p. 239 (Fort Webster, N. Mex.).

Chars. subsp.—Similar to *Chordeiles virginianus howelli*, but upper surface, both ground color and markings, much darker, the latter more tawny and also coarser; lower parts posteriorly more buffy, anteriorly more rufescent.

Iris dark brown; bill black; feet gray.

Measurements.—Male: Total length (in flesh), 228.6–243 (average, 236.2 mm.;[1] extent of wing, 535.9–617.5 (596.6).[1]

Female: Total length (in flesh), 222.3–241.3 (232.5);[2] extent of wing, 573–603.3 (593.7).[3]

Male[4]: Wing, 188–209.5 (average, 199.7) mm.; tail, 104–116.5 (111.1); exposed culmen, 6.5–7.5 (7.0); tarsus, 13.9–15.8 (14.6); middle toe, 14–16.5 (15).

Female[5]: Wing, 182–198 (189.5); tail, 102.5–117.5 (110); exposed culmen, 6.0–7.5 (6.6); tarsus, 12.5–14.8 (14.1); middle toe, 13.2–16 (14.7).

Type-locality.—Fort Webster, southern New Mexico.

Geographical distribution.—Southwestern United States and extreme northwestern Mexico; south in migration through Mexico, probably to South America. Breeds in the Lower Austral, Upper Austral, Transition, and Canadian zones, north to Taos, central northern New Mexico; Montrose, southwestern Colorado; Keam's Canyon in Navajo County, San Francisco Mountain, and the Hualapai Mountains, in north central Arizona; west to Mellen, central western Arizona; Prescott, central Arizona; Picacho Peak, south central Arizona; and Nogales, central southern Arizona; south to Nogales, central northern Sonora; Babicora, central western Chihuahua; and Alamito (Presidio County), central western Texas; and east to Fort Stockton and Pecos City, central western Texas; Carlsbad and Roswell, southeastern New Mexico; with Santa Rosa and Glorieta, north central New Mexico. Migrates through Mexico, east to Tamaulipas, and west to Jalisco, and presumably through Central America. Winters probably in South America.

Remarks.—The present race proves not to be relatively so light, particularly on the upper parts, as it has credit for being, and is darker than any of the other western United States forms excepting *Chordeiles virginianus hesperis*. The male is similar to the same sex of *Chordeiles virginianus hesperis*, but is lighter, more brownish above, with the light mottlings coarser, more numerous, and much more tawny; below lighter, the dark areas of the anterior parts more rufescent brown (less blackish); the light ground color of the posterior surface decidedly more buffy, the dark bars narrower. From *Chordeiles virginianus sennetti* he may be distinguished by darker, much more rufescent upper parts, with coarser and more tawny light markings, and by the greater rufescence of the dark areas and the more buffy suffusion of the light areas on the ventral surface. He differs from *Chordeiles virginianus virginianus* in his much lighter, more brownish (less blackish) ground color above, the light mottlings being much more numerous, coarser, and more tawny; in the more rufescent hue of the dark areas of lower surface, and generally lighter tone below, the posterior parts more buffy, with narrower dark brown bars.

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[1] Ten specimens.
[2] Six specimens.
[3] Five specimens.
[4] Eleven specimens, from Arizona and New Mexico.
[5] Twelve specimens, from Arizona, New Mexico, and Chihuahua.

The female seems to be, on the upper surface, practically like the male, but is decidedly more buffy on the posterior lower parts. She may be distinguished from the female of *Chordeiles virginianus hesperis* by reason of her more rufescent (less grayish or blackish) brown ground color above, with much coarser, more tawny light markings.

The juvenal and first autumn plumages are much lighter on the upper parts than are those of any of the other races excepting *Chordeiles virginianus sennetti* and *Chordeiles virginianus howelli*. Compared with the latter they are much more rufescent above, and, because of this, somewhat darker.

As in other races, there is a considerable range of individual variation in both size and color. The ground color of the posterior ventral surface of the male is nearly always creamy or buffy white, but occasionally varies to almost pure white. The same parts in the female are buff or cream buff. The upper surface in both sexes is normally dark rufescent brown, even somewhat blackish, with tawny or tawny ochraceous mottlings. In some specimens, as, for instance, in No. 204516, U.S.N.M., male, from the Hachita Mountains, New Mexico, July 16, 1908, these light markings range to buff and even whitish. Sometimes the ground color of the upper parts is of a much lighter brown, so that it is much like that of *Chordeiles virginianus howelli*, as in No. 6013, U.S.N.M., male, from Nogales, Arizona, June, 1857; and No. 16587, Field Museum, male, from the Huachuca Mountains, June 7, 1901; but such specimens are distinguishable by the more buffy abdomen.

Breeding birds from southern Arizona and northern Chihuahua, Mexico, represent the extreme differentiation of the present race. Those from New Mexico are, as a whole, somewhat less ochraceous or tawny, but are just as dark. A specimen from Taos, in northern New Mexico, is intermediate between *Chordeiles virginianus henryi* and *Chordeiles virginianus howelli*, being lighter and less ochraceous above, but, so far as we can determine from a single individual, it is nearer the former. Two specimens from Paisano, in central western Texas (Nos. 140404 and 140405, U.S.N.M.), taken, July 14, 1890, by Mr. William Lloyd, are less ochraceous above than even New Mexico birds, in this respect like *Chordeiles virginianus howelli*, but they are, nevertheless, dark like *Chordeiles virginianus henryi;* in size they are rather small, verging in this respect toward *Chordeiles virginianus aserriensis;*[1] they seem, however, all things considered, to be properly referable to *Chordeiles v. henryi*, as they are much too dark and also too large for *Chordeiles virginianus aserriensis*. This identification is strengthened by two other specimens—one from Fort Stockton, western Texas (No. 43532, M.C.Z.), taken, May 24, 1860; and the other from the crossing of the Pecos River, near the mouth of Delaware Creek, in southern New Mexico (No. 17607, M.C.Z.), taken, June 11, 1855, both of which are seen to be much like typical *Chordeiles virginianus henryi*.

The amount of variation in size among specimens of this subspecies from various parts of its range are illustrated in the subjoined table of average millimeter measurements:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Six males, from Arizona	198.8	110.5	7	14.5	14.9
Five males, from New Mexico	200.8	111.8	7.1	14.8	15.1
One male, from western Texas	193	105	7	14.1	14.2
Five females, from Arizona	187.2	107.8	6.5	13.9	14.6
Four females, from Chihuahua, Mexico	191	112.3	6.8	14.3	14.8
Three females, from New Mexico	191.3	110.7	6.5	14.1	14.9
Three females, from western Texas and southeastern New Mexico	190	108.3	6.1	13.4	13.7

A specimen of this race from Guadalajara, Jalisco, indicates that it migrates through Mexico on its way to and from its probable winter home in South America. There are records of *Chordeiles virginianus* "*henryi*" from Jerez, Zacatecas, Mexico;[2] Southern Pine Ridge, British Honduras;[2] Bogota, Colombia;[3] and South America down to Chupat, Patagonia;[2] but there is, in the absence of specimens, no means of determining to which one of the five western subspecies these records belong.

This subspecies breeds at about the same time of year as the more northern races; and there are eggs in the United States National

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[1] See p. 71.

[2] Hartert, Cat. Birds Brit. Mus., vol. 16, 1892, p. 613.

[3] Idem, p. 612.

Museum, taken by C. M. Barber, in the Sierra Madre of Chihuahua, at 8,000 feet altitude, on June 14, 1899; and from San Luis Spring in the San Luis Mountains in southwestern New Mexico, taken on July 3, 1892, by Dr. E. A. Mearns.

In the original description of *Chordeiles virginianus henryi*,[1] Mr. Cassin mentions specimens of this form that Dr. T. C. Henry obtained at Fort Webster, and that Lieut. Gunnison's exploring party collected in New Mexico. As we have already shown,[2] Prof. S. F. Baird considered as the type the specimen which Kreutzfeldt, who was naturalist to Lieutenant Gunnison's party under Lieutenaht Beckwith, collected in the San Luis Valley in southern Colorado, this being then a part of New Mexico. This supposed type is a juvenal female, whereas the bird actually described by Cassin is an adult male, the description of which agrees very satisfactorily in both color and size with the specimen now considered as the type in the Academy of Natural Sciences of Philadelphia. The bird now in question is marked on the present red type label, the original label having apparently been lost, as follows: "24179—Type of Chordeiles Henryi Cass. Bds. Col. & Tex., p. 233"; and on the reverse side, "Rio Grande Lat 32° Dr T C Henry."

Witmer Stone, in his account of the type specimens of birds in the Academy of Natural Sciences of Philadelphia,[3] gives the type-locality of *Chordeiles virginianus henryi* as "Rio Grande, Lat. 32°," evidently copying the data from the label of the above specimen marked as type.

Cassin, in his original description of *Chordeiles virginianus henryi*, evidently intended to base the name on the specimen obtained by Dr. T. C. Henry, for it is the one he fully describes and of which he gives measurements; furthermore, mentions the female (i. e., the specimen collected in southern Colorado by Mr. Kreutzfeldt, of Lieutenant Gunnison's party) only incidentally and briefly; and speaks as follows of the origin of his material:[1] "Specimens of this interesting species have been procured at Fort Webster, New Mexico, by Dr. Henry and by the unfortunate party under command of the late Lieutenant Gunnison." Finally he named the new bird in honor of Dr. T. C. Henry. Thus it appears that Henry's specimen, now regarded as the type in the Academy of Natural Sciences of Philadelphia, is from Fort Webster, or it is from the Rio Grande at latitude 32°, or it is not the type. The first is undoubtedly the true status of this case; for many of the labels used by Henry had printed on them the locality "Rio Grande Latitude 32°," and he doubtless tied one of these to the specimen, and neglected to change the locality. Furthermore, Cassin had ample opportunity to learn from Henry the true source of the specimen. Witmer Stone, in his above-mentioned account of the type, adds that another specimen with the same data is in the United States National Museum as No. 6005. It is, however, practically certain that this "No. 6005, U.S.N.M." is the very same as the real type now in the Academy of Natural Sciences of Philadelphia, for this specimen the Smithsonian Institution returned to Doctor Henry in 1859, and the bird thence found its way into the Academy collection. In the bird catalogue of the United States National Museum (i. e., the Smithsonian Institution) it is entered as from "Rio Mimbres L. 32°"; and Professor Baird, who doubtless was aware of its true locality, recorded it[1] as from the Rio Mimbres (i. e., Fort Webster). This is added evidence, if any be needed, that the type locality is Fort Webster, for Professor Baird was undoubtedly familiar with the correct localities of Doctor Henry's specimens, as other cases go to prove.

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[1] Illust. Birds Cal., Texas., Ore., Brit. and Russ. Amer., vol. 1, 1855, p. 239.

[2] Pages 62–63.

[3] Proc. Acad. Nat. Sci. Phila., 1899, p. 30.

The type is a very dark specimen, blackish on the upper parts, with deep tawny markings, and is an extreme example of the Arizona race. It has been mounted and is somewhat discolored, though still well preserved.

Specimens examined.—Of this subspecies 62 specimens have been available, from the subjoined localities:

Arizona.—Fort Huachuca (June 2 and 3, 1892); Santa Cruz River, west of the Patagonia Mountains (June 7 and 21, 1893); Santa Rita Mountains (June 11 and 14, 1884); San Pedro River, Cochise County (June 10, 1902); Huachuca Mountains, 9,000 feet altitude (June 17 and 23, 1902; July 8 and 10, 1896; July 16, 1901; Aug. 17, 1902); foothills of Huachuca Mountains (June 7, 1901); Picacho Peak, Pinal County (May 9, 1885); Fort Whipple (Prescott) (Aug. 11, 1864); Winslow, 2 miles east of Little Colorado (July 10, 1887); Flagstaff (June 18, 1887); Salmon Lake (July 7, 1887).

Colorado.—Montrose (July 9, 1885).

New Mexico.—Carlsbad (Sept. 4, 1901); Hachita (July 16, 1908); Santa Fe (Aug. 23, 1882); Apache in Grant County (Aug. 18, 1886); Santa Rosa (June 3, 1903); northwestern foothills of Capitan Mountains (June 30, 1903); Fort Webster; crossing of Pecos River, near the mouth of Delaware Creek (June 11, 1855, J. Pope); eastern side of San Luis Mountains, Mexican boundary line (June 25, 1892); Bear Ridge, Zuñi Mountains (June 14, 1909); Copperton (July 20, 1905); Taos, 7,400 feet altitude (July 15, 1904); Lang Ranch, Animas Valley (Aug. 11, 1908).

Texas.—Fort Clark (May 27, 1898); San Antonio (May 9, 1889); Paisano (July 14, 1890); Fort Stockton (May 24, 1860); Pecos City (May 24, 1887); 25 miles south of Alpine (July 2, 1901).

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[1] Rep. Explor. and Surv. R. R. Pac., vol. 9, 1858, p. 154.

Campeche.—La Tuxpana (Apr. 8, 1913; Sept. 7, 1910).

Chihuahua.—Chihuahua (Aug. 12, 1889); Whitewater, United States boundary line (June 17 and 20, 1892); Babicora (June 21, 1902); Pacheco (July 28, 1905; Aug. 6 and 12, 1905).

Jalisco.—Guadalajara.

Sonora.—Nogales (June, 1857).

Tamaulipas.—Montelunga (Apr. 30, 1909); Victoria (Apr. 23, 1888).

Measurements of specimens of Chordeiles virginianus henryi.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
H. S. Swarth 2853[1]	Male....	San Pedro River, Cochise Co., Ariz.	June 10, 1902	H. S. Swarth	209.5	112	7	15	15.5
H. S. Swarth 228[1].	...do....	Huachuca Mountains, Ariz.	June 10, 1896	.....do......	204	112	7.3	15	15.5
G. F. Morcom 3084[1]	...do....	.....do...........	Aug. 17, 1902	.....do......	188	108	7.2	14.1	14.2
G. F. Morcom ——[1].	...do....	.....do...........	July 10, 1896	.....do......	197	112	7	14.2	15.2
Field Mus. N. H. 16587.[1]	...do....	.....do...........	June 7, 1901	G. F. Breninger.	189	104	6.5	13.9	14
U.S.N.M. 129246[1]..	...do....	Santa Cruz River, west of Patagonia Mountains, Ariz.	June 21, 1893	F. X. Holzner.	206	115	7	15	15
Carnegie Mus. 19842.[1]	...do....	Apache, Grant Co., N. Mex.	Aug. 18, 1886	A. W. Anthony.	206	110.5	7.5	15.8	16.5
U.S.N.M. 186649[1]..	...do....	Capitan Mountains, N. Mex.	June 30, 1903	J. H. Gaut..	191.5	107	6.5	14.2	14.7
U.S.N.M. 204516[1]..	...do....	Hachita, N. Mex..	July 16, 1908	C. Birdseye.	201	112	7.1	14.8	15.5
U.S.N.M. 186102[1].	...do....	Santa Rosa, N. Mex.	June 3, 1903	V. Bailey...	198	113	7	15	15
A. N. S. Phila. 24179.[1]	[Male ?].	"Rio Grande, lat. 32°"=Fort Webster, N. Mex.	....	T. C. Henry.	207.5	116.5	7.2	14.	14
U.S.N.M. 140404..	Male....	Paisano, Brewster Co., Tex.	July 14, 1890	W. Lloyd...	193	105	7	14.1	14.2
Field Mus. N. H. 16586.[1]	Female.	Huachuca Mountains, Ariz.	July 16, 1901	G. F. Breninger.	183	102.5	6.9	14.5	15
H. S. Swarth ——[1].	...do....	.....do...........	July 8, 1896	H. S. Swarth	187.5	115	6.5	14	15.3
G. F. Morcom 2868[1].	...do....	.....do...........	June 23, 1902	.....do......	192	105	6.1	12.5	14
Am. Mus. N. H. 51995.[1]	...do....	Baker's Butte, 36 miles east of Fort Verde, Ariz.	July 10, 1887	E. A. Mearns	182	106.5	6.1	14.5	14.5
Am. Mus. N. H. 51996.[1]	...do....	.....do...........	.....do......	.....do......	191.5	110	7	14	14.3
Am. Mus. N. H. 81588.[1]	...do....	Chihuahua, Chihuahua, Mex.	Aug. 12, 1889	[W. Lloyd]..	197	116.5	7.3	14.5	14.5
Field Mus. N. H. 12670.[1]	...do....	Babicora, Chihuahua, Mex.	June 21, 1902	G. F. Breninger.	184	107	7.5	14	14.5
U.S.N.M. 127876[1].	...do....	Mexican and United States boundary line at Whitewater, Chihuahua, Mex.	June 20, 1892	E. A. Mearns and F. X. Holzner.	192.5	117.5	6.5	14.8	15.3
U.S.N.M. 127877[1]..	...do....	Whitewater, Chihuahua, Mex...	June 17, 1892	E. A. Mearns	190.5	108	6	13.9	14.8
U.S.N.M. 205627[1]..	...do....	Bear Ridge, Zuñi Mountains, N. Mex.	June 14, 1909	E. A. Goldman.	187	111.5	6	13.5	13.2
U.S.N.M. 205626[1]..	...do....	.....do...........	.....do......	.....do......	189	109	6.5	14.1	15.5
U.S.N.M. 194546[1].	...do....	Taos, N. Mex....	July 15, 1904	V. Bailey...	198	111.5	7	14.7	16
U.S.N.M. 140405...	...do....	Paisano, Brewster Co., Tex.	July 14, 1890	W. Lloyd...	188	107	5.5	13	14
M.C.Z. 43532......	...do....	Fort Stockton, Tex.	May 24, 1860	....	191.5	110.5	6.8	13.1	13.1
M.C.Z. 17607......	...do....	Crossing of Pecos River, near mouth of Delaware Creek, N. Mex.	July 11, 1855	J. Pope.....	190.5	107.5	6	14	14

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[1] Used in measurement averages on p. 65.

[2] Type.

CHORDEILES VIRGINIANUS ASERRIENSIS Cherrie.

Chordeiles virginianus aserriensis CHERRIE, Auk, vol. 13, April, 1896, p. 136 (Valley of Aserri River, San José, Costa Rica).

Chars. subsp.—Resembling *Chordeiles virginianus sennetti*, but decidedly smaller; general tone of upper parts lighter and more ochraceous, the light areas more buffy or ochraceous (less grayish or whitish) and somewhat more extensive; and the dark brown areas of anterior lower surface less grayish.

Measurements.—Male: Total length (in flesh), 223–240 (average 232) mm.;[1] extent of wing, 573–585 (578.7).[1]

Male:[2] Wing, 179–188 (average, 183.7) mm.; tail, 94.5–105 (101.1); exposed culmen, 6.0–7.9 (6.7); tarsus, 13.8–15.1 (14.5); middle toe, 13–14.8 (13.9).

Female:[2] Wing, 179–185.5 (182.7) mm.; tail, 98.3–106 (102.6); exposed culmen, 6.3–7.5 (6.9); tarsus, 13.5–14.8 (14.2); middle toe, 14–15.5 (14.4).

Type-locality.—Valley of the Aserri River, near San José, Costa Rica.

Geographical distribution.—Central southern Texas, and northern Tamaulipas, Mexico; south in migration to Costa Rica and probably South America. Breeds in the Lower Austral Zone, north to San Antonio and Rock Springs, south central Texas; west to Samuels, Texas; south to Matamoros, northeastern Tamaulipas, Mexico; and east to Brownsville, Corpus Christi, Wharton County, and Richmond, central southern Texas. Migrates south through eastern Mexico and Costa Rica. Winters probably in South America.

Remarks.—This heretofore unrecognized race seems to be in color most nearly like *Chordeiles virginianus sennetti*, though in this respect also near *Chordeiles virginianus howelli* and probably in reality most closely resembling this form, which it adjoins geographically. From the latter it may be distinguished in the male by smaller size, rather lighter, somewhat less brownish (more grayish) upper parts, with less ochraceous (more whitish or grayish) markings, and slightly less buffy posterior lower parts. It differs more strongly from *Chordeiles virginianus henryi* in its smaller size; much lighter, more grayish (less brownish) upper surface, with finer, much more grayish and whitish (less ochraceous and tawny) light markings; nearly or quite white, instead of buffy, posterior lower surface; and less rufescent dark areas of the anterior under parts.

The female of this subspecies is much more deeply buffy on the posterior lower surface than is the male, and also averages slightly paler, more brownish above, with markings more tawny or ochraceous. She may be differentiated from the female of *Chordeiles virginianus howelli* by her lighter, less brownish (more grayish) upper surface, with less tawny and ochraceous in the light markings; and by the less deeply buffy lower parts.

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[1] Three specimens.

[2] Ten specimens, from Texas.

No juvenal or first autumn specimen of *Chordeiles virginianus aserriensis* has been available, but in this plumage this race is doubtless similar to that of *Chordeiles virginianus howelli*, though more grayish; that is, intermediate in color between the latter form and *Chordeiles virginianus sennetti*.

Individual variation has about the same range as in other races, though greater than in some. In the male the posterior lower parts are usually almost pure white, occasionally washed with buff; the breast and jugulum dark brown, varying to a much lighter shade, which is still further lightened by being much obscured by large buff and cream buff spots. The upper surface of the male is in color normally somewhere between *Chordeiles virginianus sennetti* and *Chordeiles virginianus howelli*, but rather lighter than either. From this it varies to (1) a much more brownish shade, with buffy ochraceous markings, so that it is practically like *Chordeiles virginianus howelli*, as in No. 81582, American Museum of Natural History, Corpus Christi, Texas, April 24, 1889; to (2) a still lighter brown, which is more heavily light-mottled, as in No. 152229, U.S.N.M., San Antonio, Texas, May 9, 1891; to (3) a very grayish and blackish condition, with the light mottlings somewhat reduced, so that it becomes almost like *Chordeiles virginianus sennetti*, as in No. 27307, Acad. Nat. Sci. Phila., Corpus Christi, Texas, May 23, 1891; and to (4) a condition like the last, but with the light mottlings much reduced, so that the general tone is much more blackish—almost identical with typical *Chordeiles virginianus hesperis*, as in No. 203649, U.S.N.M., Runge, Texas, September 21, 1906. These variations are, of course, exceptional; and *Chordeiles virginianus aserriensis* is so much smaller than any of the races that it closely resembles in color that there should usually be no difficulty in identifying specimens. Some such individuals as (3) have been identified as *Chordeiles virginianus* "*sennetti*," and the so-called Texas "type" of *Chordeiles virginianus sennetti* has been found to be one of these. In the female the ground color of the posterior lower surface ranges from buffy white to deep buff, and averages about cream buff. The upper parts vary about as in the male: To (1) a light brown with ochraceous mottling, very much like the same sex of *Chordeiles virginianus howelli*, as in No. 19853, Carnegie Museum, Cameron County, Texas, May 16, 1902; to (2) a similar light brown, more heavily mottled, but with less ochraceous, as in No. 197786, U.S.N.M., Runge, Texas, August 25, 1905; and to (3) a very dark, blackish brown, with much reduced light marking, so that it closely resembles the female of *Chordeiles virginianus hesperis*, as in No. 81569, Amer. Mus. Nat. Hist., Corpus Christi, Texas, May 15, 1882.

The limited breeding area of this race permits little opportunity for geographical variation within its boundaries, and there is none worth mentioning. This bird breeds in Texas from April to July, and there are eggs in the United States National Museum collected from April 24 to June 28.

An adult male of this race in the Sennett collection (No. 81591, Amer. Mus. Nat. Hist.), from Wharton County, Texas, taken May 27, 1887, was marked by Dr. Elliott Coues as one of the types of his *Chordeiles popetue* [=*virginianus*] *sennetti*,[1] and upon this basis the range of the latter was extended to Texas. This specimen, as we have already shown,[2] can not be considered the type of *Chordeiles virginianus sennetti*, but must be referred to the present form.

Regarding the name we are here using for this race the following remarks are necessary: G. K. Cherrie some 18 years ago described[3] a nighthawk from a few specimens from Central America. His type was a specimen taken on the Aserri River, near San José, Costa Rica, and he therefore called the supposed new race *Chordeiles virginianus aserriensis.* I have made every effort to trace this type specimen, but without any success; and Mr. Cherrie himself assures me that he has no idea where it finally went. The application of this name must therefore be settled chiefly by the original description. There is no doubt that Mr. Cherrie had in hand a male nighthawk of the *virginianus* style in fully grown juvenal or first autumn plumage, not adult, as he supposed. Allowing for this immaturity, the characters that Mr. Cherrie gives are just those distinguishing the small, pale race which summers in southern Texas. A little additional light is thrown on the subject by a juvenal male nighthawk, No. 128373, U.S.N.M. (still in the National Museum), collected by Dr. C. W. Richmond on the Escondido River, 50 miles from Bluefields, Nicaragua, October 28, 1892. This specimen Mr. Cherrie refers to his new race with the remark that it is much darker on the upper surface than his type, as it should be, for it turns out to be really an example of *Chordeiles virginianus hesperis!* It is, of course, often difficult, owing to the great range of individual variation in all the races of this species, to identify a specimen with absolute certainty from a description alone; but in this case, in view of the rather full description which agrees in all respects with the characters of the present form, it seems best to use for this race the title

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[1] Auk, vol. 5, January, 1888, p. 37.

[2] Pages 55–56.

[3] Auk, vol. 13, April, 1896, p. 136.

Chordeiles virginianus aserriensis until this name can be proved ineligible from an examination of the type.

Specimens examined.—Fifty-three specimens of this race have been handled, from the following localities:

Texas.—Fort Brown (June 25 and 28, 1877); Brownsville (Apr. 15, 1892; Apr. 25, 1889; Aug. 11, 1891); Cameron County (May 6, 8, 10, 12, and 16, 1902; May 7, 1903); Fort Clark (Apr. 29, 1893; May 17, 1893; May 25, 1898); Rock Springs (July 11, 1902); Corpus Christi (Apr. 14, 1900; Apr. 24, 1889; Apr. 26, 1882; May, 1892; May 15, 1882; May 23, 27, 30, and 31, 1891; June, 1886; June 13, 20, and 23, 1887; July 5, 1887; Nov. 6, 1909); Bee County (Apr. 18 and 19, 1887); Runge (Aug. 25, 1905; Sept. 21, 1906); San Antonio (May 9, 1891); Wharton County (May 27, 1887); Refugio County (June 6, 1887).

Campeche.—La Tuxpana (May 8, 1912; Sept. 28, 1912; Oct. 5, 1912).

Tamaulipas.—Matamoros (Aug. 15 and 23, 1908).

Measurements of specimens of Chordeiles virginianus aserriensis.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Am. Mus. N. H. 81591.[1]	Male[2]...	Wharton Co., Tex.	May 27, 1887	....	184.5	102	7.2	15	14
Am. Mus. N. H. 81596.[1]	...do.....	Corpus Christi, Tex.	June 3, 1887	....	187	101	7.9	14	14
Am. Mus. N. H. 81592.[1]	...do.....	.....do............	Apr. 26, 1882	....	182	101	6.1	13.8	14.3
Am. Mus. N. H. 81568.[1]	...do.....	.....do............	July 5, 1887	....	185.5	101	6.5	14.5	13.5
Am. Mus. N. H. 67414.[1]	...do.....	.....do............	May 6, 1892	C. A. Smith.	188	105	.....	15.1	13
U.S.N.M. 165962[1]..	...do.....	.....do............	Apr. 14, 1900	V. Bailey...	182	104	6	14.8	14.8
A. N. S. Phila. 27307.[1]	...do.....	.....do............	May 23, 1891	S.N.Rhoads.	182	100.3	6.9	14.3	14
Am. Mus. N. H. 81590.[1]	...do.....	Brownsville, Tex.	Apr. 25, 1900	....	181.5	94.5	6.5	14.5	14.5
Am. Mus. N. H. 81580.[1]	...do.....	Bee Co., Tex.....	Apr. 18, 1887	....	179	99	6.5	14	13
Am. Mus. N. H. 81597.[1]	...do.....	Refugio Co., Tex..	June 6, 1887	....	185	103.5	7	14.7	14
Am. Mus. N. H. 81584.[1]	Female..	Corpus Christi, Tex.	Apr. 24, 1889	J. A. Singley	188	99.5	7.5	14.5	14
Am. Mus. N. H. 81585[1]	...do.....	.....do............	.....do.......	.....do.......	185	100.5	6.5	14.6	14.6
Am. Mus. N. H. 81595.[1]	...do.....	.....do............	June 23, 1887	....	185.5	104.8	6.8	14	14.8
Am. Mus. N. H. 81594.[1]	...do.....	.....do............	June 20, 1887	....	184	.....	7	14.8	.....
Am. Mus. N. H. 81593.[1]	...do.....	.....do............	June 23, 1887	....	185	108	7.1	14	14
A. N. S. Phila. 27306.[1]	...do.....	.....do............	May 31, 1891	S.N.Rhoads.	179	106	6.9	14	14
A. S. N. Phila. 27311.[1]	...do.....	.....do............	May 30, 1891	.....do.......	185	102	6.5	14	14
U.S.N.M. 197786[1].	...do....	Runge, Tex......	Aug. 25, 1905	A.H.Howell	182	106	7.5	13.5	14.3
U.S.N.M. 73019[1]...	...do.....	Fort Brown, Tex..	June 25, 1877	J. C. Merrill.	179	103	6.5	14.5	15.5
Carnegie Mus. 19853.[1]	...do.....	Cameron Co., Tex.	May 16, 1902	....	179	98.3	6.3	14	14

[1] Used in measurement averages on p. 71.

[2] Marked by Dr. E. Coues as one of the types of *Chordeiles virginianus sennetti.*

CHORDEILES VIRGINIANUS CHAPMANI Coues.

[*Chordiles popetue*] *Chapmani* Coues, Auk, vol. 5, January, 1888, p. 37 (ex Sennett MS.) (Gainesville, Florida).

Chars. subsp.—Like *Chordeiles virginianus virginianus*, but decidedly smaller; upper parts averaging a little more mottled and spotted with whitish and buffy, particularly on back, wings, and scapulars, and the ground color averaging slightly less deeply blackish (more grayish or brownish); posterior lower parts usually more purely white.

Iris brown or hazel brown; bill black or dull blackish; feet dull grayish brown, dull or dark horn color.

Measurements.—Male: Total length (in flesh), 223–232 (average, 227.5) mm.;[1] extent of wing, 451–580 (515.5).[1]

Female: Total length (in flesh), 209.6–235 (223.5)[2]; extent of wing, 533.4–575 (561.6).[3]

Male[4]: Wing, 178–192 (average, 184.1) mm.; tail, 99–110.5 (105); exposed culmen, 4.8–7.0 (6.3); tarsus, 12.5–15.5 (13.9); middle toe, 13–15.8 (14.2).

Female:[5] Wing, 172.5–184.5 (179.4) mm.; tail, 99–108.5 (103.2); exposed culmen, 5.0–7.5 (6.3); tarsus, 13.2–15 (14); middle toe, 13.8–15.8 (14.4).

Type-locality.—Gainesville, northern Florida.

Geographical distribution.—Southeastern United States, south in winter to southern South America. Breeds in the Lower Austral and Upper Tropical zones, north to Fort Macon, central eastern North Carolina; Raleigh, central North Carolina; Chester County, north central South Carolina; Augusta, central eastern Georgia; Coosada and Greensboro, central Alabama; Mount Carmel, southeastern Illinois; Hickman, southwestern Kentucky; Stuttgart and Delight, south central Arkansas; and New Boston in Bowie County, northeastern Texas; west to Rice's Prairie in Bowie County, and Galveston Island, eastern Texas; south to Galveston Island and Sabine, southeastern Texas; Calcasieu Pass, Avery Island, and Houma, southern Louisiana; Bay Saint Louis and Biloxi, southeastern Mississippi; Petit Bois Island, southwestern Alabama; Pensacola and the lower part of the Suwanee River, northwestern Florida; and Tarpon Springs, Puntarasa, and Key West, western Florida; east to Miami, Canaveral, and Fernandina, eastern Florida; St. Marys, mouth of Altamaha River, and Savannah, southeastern Georgia; Mount Pleasant, southeastern South Carolina; and Fort Macon, central eastern North Carolina. Migrates south through the Greater Antilles (probably), Yucatan, Nicaragua, and Costa Rica, to South

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[1] Two specimens.

[2] Eleven specimens.

[3] Six specimens.

[4] Fourteen specimens from Florida.

[5] Ten specimens from Florida.

America. Winters in southern South America, south to Concepcion del Uruguay, and Ysca Yacu in the Province of Santiago, northern Argentina; and north to Chapada in Matto Grosso, central western Brazil.

Remarks.—Although the Florida nighthawk is commonly supposed to be in color exactly like *Chordeiles virginianus virginianus*, it has certain color characteristics which are at least average, as the above diagnosis indicates. The male of *Chordeiles virginianus chapmani* differs from that of *Chordeiles virginianus hesperis* in his smaller size, darker, rather more blackish (less brownish), upper parts, which have fewer light mottlings. From *Chordeiles virginianus aserriensis* he is distinguishable by his much darker upper surface, the dark areas being more blackish, less grayish, brown, with much less numerous light mottlings; and darker lower parts, the dark areas anteriorly being more blackish, and the posterior portion more heavily barred.

The female, except, of course, for differences common to all the subspecies, is almost identical with the male in color and markings above, though averaging in general tone slightly more brownish; but the posterior lower parts are more buffy. She is similar to the female of *Chordeiles virginianus virginianus*, but averages a little less brownish (more blackish) on the upper surface, and somewhat less buffy or ochraceous on the posterior lower parts.

The first autumn plumage is practically identical with that of first autumn *Chordeiles virginianus virginianus*. Above this is much like adult *Chordeiles virginianus sennetti*, and, indeed, occasional specimens are scarcely distinguishable on the upper surface, though usually the dark areas are more deeply blackish and the light markings finer. It is also much like the *adult* of *Chordeiles virginianus hesperis* on the upper surface, but lighter, the dark areas being less deeply black (more grayish or brownish), more extensively and finely mottled with whitish, particularly on back, scapulars, and tertials.

Individual and seasonal variations in this race are practically the same as in *Chordeiles virginianus virginianus*.

There seems to be little geographical variation throughout the rather extensive breeding range of this subspecies, for specimens from southeastern South Carolina, Florida, southern Alabama, southern Louisiana, and southeastern Texas are practically identical in both size and color. A single example (No. 84251, U.S.N.M.) from Mount Carmel, Illinois, taken, June 7, 1874, is, in measurements, nearer the present race, though in color like *Chordeiles virginianus virginianus*, but on the whole seems best referred to the former. A female from Stuttgart, Arkansas, taken, May 13, 1910, is apparently typical *Chordeiles virginianus chapmani*. A single male (No. 57904, U.S.N.M.) from Macon, North Carolina, collected, June 10, 1869, is surely of the present race, and represents the breeding form of this locality, though a female from the same locality and taken on the same date appears to be a belated migrant *Chordeiles virginianus virginianus.* Birds from Raleigh, North Carolina, of dates from August 5 to August 10, are decidedly nearer the Florida race than to *Chordeiles virginianus virginianus*, as the accompanying measurements show. A table of comparative average measurements of specimens from various parts of the range of *Chordeiles virginianus chapmani*, from which may be seen any local differences in size, is here appended:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Fourteen males, from Florida	184.1	105	6.3	13.9	14.2
Three males, from Alabama	182.8	104.2	6.8	14.3	15
Two males, from Texas	183.8	102.3	6.9	15	15.3
One male, from Louisiana	189	103	6.7	15	15
One male, from southern Illinois	186	115	6.5	14.5	14.5
Two males, from North Carolina	190	106	6.6	14	14.3
Ten females, from Florida	179.4	103.2	6.3	14	14.4
Three females, from southern Alabama	175.3	101.3	6.5	15.2	15.5
One female, from Texas	178.5	102	7	15	15
One female, from Louisiana	186	104.5	7.1	14.9	15.8
One female, from Arkansas	178.5	102.5	6.8	15	16
Two females, from North Carolina	185.8	106	6.6	14	15.6

The present race winters in Argentina, and its route of migration lies, so far as the present material indicates, across the Gulf of Mexico, through southeastern Mexico, Central America, and South America. Possibly some individuals follow the coast of eastern Mexico, as there is a specimen from Brownsville, in the extreme southern corner of Texas, taken on March 15. There is, however, not a record from any of the islands of the West Indies, but we have examined a specimen taken at sea off the coast of Colombia. It lingers in Central America, at least sometimes, until about the 1st of June, for M. A. Carriker obtained it at Miravalles, Costa Rica, on May 27, 1906.[1] It rears apparently but one brood, though we have records of eggs from April 24 to June 17.

Specimens examined.—The specimens of the present form examined number 107, from the localities in the list below:

Alabama.—Dauphine Island (May 18, 1911); Bayou La Batre (Aug. 2, 1911; July 25, 1911); Mobile Bay (Apr. 19, 1892); Abbeville (June 9, 1911); Petit Bois Island (July 28, 1911; Aug. 30, 1911); 5 miles west of Greensboro (June 26, 1890); Wilsonville (June).

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[1] The label of this specimen reads *June* 27, 1906, which is evidently a lapsus for *May* 27, since Mr. Carriker records specimens of *Chordeiles virginianus* from this locality on May 24 and 25, 1906 (Ann. Carnegie Mus., vol. 6, 1910, p. 501), and this subspecies does not breed south of the United States.

Arkansas.—Stuttgart (May 13, 1910).

Florida.—Wolf Island Bluff Landing, lower Kissimmee River (Apr. 10, 1907); Jacksonville (Apr. 12, 1869; Apr. 20, 22, and 23, 1877); Dry Tortugas (Apr. 17, 1890; Apr. 20, 1902); Alligator Bluff, Kissimmee River (Apr. 23 and 28, 1901); Hillsboro (May 17, 1900); Tarpon Springs (June 6, 15, 21, and 28, 1893; July 5, 6, 12, 15, and 28, 1893); Amelia Island (Apr. 20, 1901); Allen's Creek, near Tampa (Apr. 19, 1883); Whitfield (Apr. 24 and 25, 1903); near Tantie, southern St. Lucie County (Apr. 20 and 24, 1904); Fleming's Island, Lake Tahopekaliga, near Kissimmee (May 9 and 10, 1901); San Mateo (May 24, 1892); Gainesville (May 19 and 20, 1887); West Jupiter (June 2, 1896; Apr. 25, 1896); Clearwater (Sept. 18, 1896); Moses Creek (May 16, 1894); Pellicier's Creek (May 20, 1894); Tampa; Merritt's (May 9, 1886).

Illinois.—Mount Carmel (June 7, 1874).

Louisiana.—Avery (June 7, 1895); Avery's Island (May 7, 1896).

North Carolina.—Raleigh (Aug. 5, 1896; Aug. 8, 1894; Aug. 10, 1893); Fort Macon (June 10, 1869).

South Carolina.—Lady's Island (May 6, 1869); Anderson.

Texas.—Sour Lake (July 15, 1902); Rockport (Aug. 18 and 23, 1893); Sabine (Sept. 2, 1902); China (Aug. 11, 1902); Victoria (Sept. 10, 1906); Corpus Christi (Oct. 21, 1909); Brownsville (Mar. 15, 1892); Rice's Prairie, near New Boston, Bowie County (June 18, 1888).

Campeche.—La Tuxpana (Sept. 28, 1912).

Yucatan.—Xbac (April, 1910).

Argentina.—Concepcion del Uruguay, Province of Entre Rios (Dec. 12, 1880; Jan. 28, 1880); Ysca Yacu, Province of Santiago del Estero (Feb. 3, 1906).

Brazil.—Chapada, Province of Matto Grosso (Sept. 26, 1885).

Colombia.—Forty miles offshore and 200 miles from Panama (October, 1864).

Costa Rica.—Rio Sicsola, Talamanca (Sept. 24 and 26, 1904); Miravalles (May ["June" on label] 27, 1906).

Nicaragua.—[No further locality specified.]

Measurements of specimens of Chordeiles virginianus chapmani.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Field Mus. N. H. 7993.[1]	Male[2]...	Gainesville, Fla...	May 19, 1887	F. M. Chapman.	179	103.5	5.5	14	14
Am. Mus. N. H. 99469.[1]	...do.....	Near Tantie, St. Lucie Co., Fla.	Apr. 20, 1904	.....do......	189	107	5.2	14.2	15.2
Am. Mus. N. H. 76530.[1]	[Male]...	Dry Tortugas, Fla.	Apr. 20, 1902	J. Thompson.	188	104.5	6.5	15.5	15.5

[1] Used in measurement averages on p. 75.

[2] Type.

Measurements of specimens of Chordeiles virginianus chapmani—Continued.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 176888[1]	Male	Alligator Bluff, Kissimmee River, Fla.	Apr. 28, 1901	E. A. Mearns	183	106.5	4.8	14	14.2
E. A. and O. Bangs 751.[1]	[Male]	Allen's Creek, Fla.	Apr. 19, 1883	....	181.5	105	6.5	12.5	14
Carnegie Mus. 12182.[1]	Male	Whitfield, Fla.	Apr. 25, 1903	W. E. C. Todd.	178	99	6.5	13	14
Carnegie Mus. 26281.[1]	...do...	Amelia Island, Fla.	Apr. 20, 1906	W. W. Worthington.	185	103.5	6.1	13.5	13
Carnegie Mus. 27477.[1]	...do...	Wolf Island Bluff Landing, Lower Kissimmee River, Fla.	Apr. 10, 1907	.....do.....	190.5	107	6.7	15	15.8
Carnegie Mus. 19837.[1]	...do...	Hillsboro Co., Fla.	May 17, 1900	....	179	104	6.8	.....	.....
A. N. S. Phila. 43992.[1]	...do...	Tarpon Springs, Fla.	June 6, 1893	W. S. Dickinson.	182	101	6	14	15.3
A. N. S. Phila. 43995.[1]	...do...	.....do.....	June 15, 1893	.....do.....	179.5	107	6.8	13.5	14
A. N. S. Phila. 43993.[1]	...do...	.....do.....	July 6, 1893	.....do.....	186	103.5	7	13.8	14
A. N. S. Phila. 31905.[1]	...do...	.....do.....	.....do.....	.....do.....	185	107.5	6.8	13.8	14.2
A. N. S. Phila. 43990.[1]	...do...	.....do.....	July 15, 1893	.....do.....	192	110.5	6.8	14	14.2
U. S. N. M. 230493	...do...	Petit Bois Island, Ala.	July 28, 1911	J. S. Gutsell.	178	102	6.5	14.8	15.8
U. S. N. M. 230491	...do...	Bayou La Batre, Ala.	July 25, 1911	.....do.....	179	101	7	14.5	14.5
U. S. N. M. 207857	...do...	Abbeville, Ala.	June 9, 1911	A. H. Howell.	191.5	109.5	7	13.5	14.8
U. S. N. M. 184788	...do...	Sabine, Tex.	Sept. 2, 1902	H. C. Oberholser.	180	103.5	7.3	15.5	16
U. S. N. M. 152231	...do...	Rockport, Tex.	Aug. 18, 1893	H. P. Attwater.	187.5	101	6.5	14.5	14.5
U. S. N. M. 153097	...do...	Avery's Island, La.	May 7, 1896	E. A. McIlhenny.	189	103	6.7	15	15
U. S. N. M. 84251	...do...	Mount Carmel, Ill.	June 7, 1874	S. Turner	186	115	6.5	14.5	14.5
U. S. N. M. 57904	...do...	Fort Macon, N. C.	June 10, 1869	E. Coues	183	102	6.2	14	14
A. N. S. Phila. 46343.	...do...	Raleigh, N. C.	Aug. 5, 1896	H. H. and C. S. Brimley.	190	106	7	14	14.5
A. N. S. Phila. 45228.	...do...	.....do.....	Aug. 8, 1894	.....do.....	190	106	6.2	14	14
Field Mus. N. H. 16593.[1]	Female	West Jupiter, Fla.	June 2, 1896	....	176	100	6.8	14	15
Field Mus. N. H. 16594.[1]	...do...	.....do.....	.....do.....	....	177	104.5	6	14	14.2
A. N. S. Phila. 43998.[1]	...do...	Tarpon Springs, Fla.	July 12, 1893	W. S. Dickinson.	172.5	104.5	5	13.5	13.8
A. N. S. Phila. 43989.[1]	...do...	.....do.....	July 15, 1893	.....do.....	179	102	7.5	14	14
U.S.N.M. 176967[1]	...do...	Fleming's Island, Lake Tahopekaliga, near Kissimmee, Fla.	May 10, 1901	E. A. Mearns	182	101.5	6.2	15	14.7
U.S.N.M. 176964[1]	...do...	.....do.....	May 9, 1901	.....do.....	184.5	103	6	14.3	15.8
U.S.N.M. 133128[1]	...do...	Pellicier's Creek, Fla.	May 20, 1894	W. Robinson	182	104.5	6.2	13.2	14.3
U.S.N.M. 133126[1]	...do...	Moses Creek, Fla.	May 16, 1894	.....do.....	182	108.5	6.1	14	14
U.S.N.M. 126109[1]	...do...	San Mateo, Fla.	May 24, 1892	W. L. Ralph	180	99	6.3	13.3	13.8
U.S.N.M. 126108[1]	...do...	.....do.....	.....do.....	.....do.....	179	104	6.7	14.5	14.5
U.S.N.M. 140389	...do...	Mobile Bay, Ala.	Apr. 19, 1892	R. J. Thompson.	182.5	105	6.9	14.8	14.8
U.S.N.M. 207834	...do...	Dauphine Island, Ala.	May 18, 1911	A. H. Howell	170	99.5	6.2	15.7	15.7
U.S.N.M. 230494	...do...	Bayou La Batre, Ala.	Aug. 2, 1911	J. S. Gutsell.	173.5	99.5	6.5	15	16
U.S.N.M. 184514	...do...	Sour Lake, Tex.	July 15, 1902	N. Hollister.	173.5	102	7	15	15
U.S.N.M. 150947	...do...	Avery, La.	June 7, 1895	E. A. McIlhenny.	186	104.5	7.1	14.9	15.8
U.S.N.M. 228070	...do...	Stuttgart, Ark.	May 13, 1910	A. H. Howell	178.5	102.5	6.8	15	16
M.C.Z. 31086	...do...	Concepcion del Uruguay, Entre Rios, Argentina.	Dec. 20, 1880	W. B. Barrows.	176	97	6.7	13.5	15
A. N. S. Phila. 44404.	...do...	Raleigh, N. C.	Aug. 10, 1893	H. H. and C. S. Brimley.	183	107	7.1	14	15.1
A. N. S. Phila. 44403.	...do...	.....do.....	.....do.....	.....do.....	188.5	105	6	14	16

[1] Used in measurement averages on p. 75.

CHORDEILES VIRGINIANUS VICINUS Riley.

Chordeiles virginianus vicinus Riley, Auk, vol. 20, October, 1903, p. 432 (Long Island, Bahama Islands).

Chars. subsp.—Resembling *Chordeiles virginianus chapmani*, but considerably smaller; the upper surface lighter, owing to more numerous light markings; and the posterior lower parts more tinged with buff, and thus darker.

Measurements.—Male:[1] Wing, 162.5–183 (average, 170.2) mm.; tail, 92–103 (96.8); exposed culmen, 6.1–7.8 (6.7); tarsus, 13–14.8 (13.4); middle toe, 13–15 (13.9).

Female:[1] Wing, 160.5–184.5 (173.2) mm.; tail, 91–102.5 (97.7); exposed culmen, 6.1–7.5 (6.7); tarsus, 12.5–14.8 (13.4); middle toe, 13–15 (14.1).

Type-locality.—Long Island, Bahama Islands.

Geographical distribution.—Bahama Islands. Breeds in the Upper Tropical Zone, north to Abaco Island, and Great Bahama Island; west to Andros Island; south to Great Inagua Island; and east to Acklin Island, Watling Island, and Eleuthera Island. Reported from the following islands: Abaco, Abaco Keys, Acklin, Andros, Eleuthera, Fortune, Grassy Cay, Great Bahama, Great Inagua, Long, Moraine Cay, New Providence, Southern Andros, Stranger Cay, Sugarloaf Cay, and Watling Island. Winter home unknown.

Remarks.—This race is, in color, except for the posterior lower parts, intermediate between *Chordeiles virginianus chapmani* and *Chordeiles virginianus aserriensis*, but is smaller than either. From the latter it differs, in addition to smaller size, in its darker upper surface, the dark brown ground color being more blackish (less grayish), the light mottlings less numerous; and in its more deeply colored inferior surface, the dark brown areas of the anterior portion more blackish, the posterior portion buff instead of nearly or quite white, and with much heavier dark cross-bars.

The female is very similar to the male, but averages lighter, somewhat more brownish (less blackish) above, more brownish (less blackish) on the jugulum, and a little more ochraceous or buffy on the posterior lower parts.

No juvenal or first-autumn specimens have been seen, but these plumages probably present the usual differences.

Individual variation is in character about as in *Chordeiles virginianus chapmani*. The upper parts of both male and female range from blackish, with light markings, much as in *Chordeiles virginianus hesperis*, to a much lighter ground color considerably more profusely light-mottled, just like *Chordeiles virginianus sennetti*. The light markings above vary from deep ochraceous buff to pure white and to grayish white with but little or no buffy tinge. The posterior lower parts of both sexes and the light throat-patch of the female vary from cream buff or buffy white to ochraceous buff.

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[1] Ten specimens, from the Bahama Islands.

No satisfactory division of this race is possible, at least with the material at present available. Birds from Andros, Great Bahama, and other islands appear to be slightly darker above than those from Eleuthera Island, but this may be due to the unevenness of the series. Differences in size, as may be noted from the table of detailed measurements, are equally difficult to correlate with any geographic areas.

This well-characterized race seems to be only a summer resident in the Bahama Islands, from which it disappears in the autumn, but there is no direct clue to its winter home. It probably, however, winters in South America along with the other forms of the species. It is known to breed in July, and probably does so also during May and June.

Specimens examined.—Of this race we have seen altogether 20 examples, from the localities in the Bahama Islands listed below:

Andros Island.—Wide Opening (June 17, 1890); Grassy Creek (June 28, 1903).

Eleuthera Island.—Governor's Harbor (July 4 and 7, 1903).

Great Bahama Island.—(July 17, 1904.)

Long Island.—(July 16 and 17, 1903.)

Moraine Cay.—(July 12 and 13, 1904.)

New Providence Island.—Nassau (May 13, 1897; May 21, 1902.)

Southern Andros Island.—(May 19, 1904.)

Stranger Cay.—(July 8 and 15, 1904.)

Sugar Loaf Cay.—(July 14, 1904.)

Measurements of specimens of Chordeiles virginianus vicinus.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 189689[1]..	Male [2]...	Long Island, Bahama Islands.	July 16, 1903	J. H. Riley..	172	100.5	7.8	14	14
U.S.N.M. 189688[1]..	...do.....	.....do............	.....do......	.....do......	163	92	6.9	13.8	13.9
U.S.N.M. 189690[1]..	...do.....	Governor's Harbor, Eleuthera Island, Bahama Islands.	July 7, 1903	.....do......	162.5	92	6.5	13.3	14
U.S.N.M. 189691[1]..	...do.....	.....do............	.....do......	.....do......	166	94.5	7.2	13.5	13.5
U.S.N.M. 189824[1]..	...do.....	Eleuthera Island, Bahama Islands.	.....do......	.....do......	175	97	6.3	14.8	15
Am. Mus. N. H. 99450.[1]	...do.....	Southern Andros Island, Bahama Islands.	May 19, 1904	F. M. Chapman.	173.5	95.5	7.2	13	13.3
Am. Mus. N. H. 54607.[1]	...do.....	Wide Opening, Andros Island, Bahama Islands.	June 17, 1890	J. I. and A. R. Northrop.	183	108	.....	13	13.8
M.C.Z. 40210[1].....	...do.....	Great Bahama Island, Bahama Islands.	July 17, 1904	....	168	100	6.2	13	13.8

[1] Used in measurement averages on p. 80.

[2] Type; original number, 183.

Measurements of specimens of Chordeiles virginianus vicinus—Continued.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
M.C.Z. 40211[1].....	Male....	Stranger Cay, Bahama Islands.	July 15, 1904	....	163.5	97.5	6.5	13	13
E. A. and O. Bangs 14975.[1]	...do....	.....do...........	July 8, 1904	....	175	96	6.1	13	14.8
U.S.N.M. 189687[1]..	Female .	Long Island, Bahama Islands.	July 17, 1903	J. H. Riley..	168	93	7.5	12.5	13.5
U.S.N.M. 189825[1]..	...do.....	Eleuthera Island, Bahama Islands.	July 4, 1903	.....do.......	167	94	6.1	13.8	14.2
U.S.N.M. 189823[1]..	...do.....	.....do...........	July 7, 1903	.....do.......	168.5	93	6.1	14.8	14.8
U.S.N.M. 189686[1]..	...do.....	Grassy Creek, Andros Island, Bahama Islands.	June 28, 1903	.....do.......	176	99	6.5	14	13
Am. Mus. N. H. 76562.[1]	...do.....	Nassau, New Providence Island, Bahama Islands.	May 21, 1902	F. M. Chapman.	160.5	95	6.5	13.5	14
E. A. and O. Bangs 3422.[1]	...do.....	.....do...........	May 13, 1897	C. J. Maynard.	184.5	101	6.9	13	14
E. A. and O. Bangs 14976.[1]	...do.....	Moraine Cay, Bahama Islands.	July 13, 1904	....	177.5	98	6.5	12.5	13.1
M.C.Z. 40213[1].....	...do.....	.....do...........	July 12, 1904	....	181	100	7.1	14	14.8
M.C.Z. 40214[1].....	...do.....	.....do...........	July 13, 1904	....	181	102.5	7	13.5	15
M.C.Z. 40212[1].....	...do.....	Sugar Loaf Cay, Bahama Islands.	July 14, 1904	....	168	91	7	12.5	14.2

[1] Used in measurement averages on p. 80.

CHORDEILES VIRGINIANUS MINOR (Cabanis).

Chordediles minor Cabanis, Journ. f. Ornith., January, 1856, p. 5 (northern coast of Cuba).

Chordeiles gundlachii Lawrence, Ann. Lyc. Nat. Hist. N. Y., vol. 6, December, 1856, p. 165 (Cuba).

Chars. subsp.—Similar to *Chordeiles virginianus vicinus*, but wing and tail somewhat shorter; upper parts darker, the light markings less numerous, coarser, and much more tawny; general tone of lower surface darker, because more deeply ochraceous or tawny, particularly on posterior portion.

Iris dark brown; bill dark brown; feet dark brown.

Measurements.—Female: Total length (in flesh), 218.4 mm.[2]

Male:[3] Wing, 159–174 (average, 168) mm.; tail, 89–97.5 (93.5); exposed culmen, 6.1–8.0 (6.6); tarsus, 12.5–14.1 (13.4); middle toe, 13–14.2 (13.9).

Female:[4] Wing, 160–174.5 (168.7) mm.; tail, 89.5–103 (95.3); exposed culmen, 6.0–7.0 (6.7); tarsus, 12–14.1 (13.3); middle toe, 13.1–14.9 (13.9).

Type-locality.—Northern coast of Cuba.

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[2] One specimen.

[3] Ten specimens, from Cuba.

[4] Nine specimens, from Cuba and Porto Rico.

Geographical distribution.—Greater Antilles. Breeds in the Upper Tropical Zone of Cuba, Jamaica, Haiti, Porto Rico, and the Isle of Pines. Winter home unknown.

Remarks.—This is the smallest and most deeply tawny or rufescent of all the races of *Chordeiles virginianus.* It is also the southernmost in distribution. It differs very decidedly from *Chordeiles virginianus* by reason of its much smaller size; coarser and much more tawny markings on the upper surface; and darker, much more rufescent, tawny, and ochraceous inferior parts.

The female of the present race is considerably more different from the male than is the case in *Chordeiles virginianus vicinus.* She has the dark areas of the upper parts more brownish (less blackish) than has the male, their light mottlings duller, more ochraceous or tawny; the dark areas of the inferior surface decidedly more rufescent (less blackish); and the posterior lower parts decidedly more ochraceous or tawny.

The first autumn plumage is similar to that of both *Chordeiles virginianus virginianus* and *Chordeiles virginianus chapmani,* but the light markings are normally much more deeply tawny. Occasional specimens are, however, more grayish, and scarcely, if at all, distinguishable.

Individual variation is great, and about the same in both sexes. There are really two fairly distinct color phases, a tawny or rufous and a gray, the latter of which is comparatively rare. Taking these two phases as the extremes, the prevailing color of the light markings above in both male and female varies from deep tawny to grayish white and creamy white; the light areas of lower parts from tawny ochraceous to grayish white in the male, and from buff to deep tawny in the female.

Specimens from the Isle of Pines appear to be identical with those from Cuba. The males we have examined from Jamaica have an average longer wing and tail than those from Cuba, but the females show no difference. In color they are all the same, and this apparent size difference would probably disappear in a larger series. How much it is appears in the following table of average measurements:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Ten males, from Cuba	168	93.5	6.6	13.4	13.9
Five males, from Jamaica	174.6	94.8	6	13.2	13.9
Eight females, from Cuba	168.1	95.3	6.7	13.5	13.9
One female, from Porto Rico	173	....	7	12	13.2
Five females, from Jamaica	168.8	95.9	6.2	13.5	13.8

The present race is a summer resident from April to October on all of the islands of the Greater Antilles. There are eggs in the United States National Museum collected from May 9 to July 7, inclusive. Like *Chordeiles virginianus vicinus*, however, it disappears in autumn, but it probably winters with the Bahama Islands form in South America.

The type of *Chordeiles virginianus minor*,[1] which was collected by Dr. Juan Gundlach in Cuba, we have not been able to examine, but there seems to be no doubt that it represents the breeding form of this island, as the original description clearly indicates. The type of *Chordeiles gundlachii* Lawrence,[2] from Cuba, which was in the collection of George N. Lawrence, and is now in the American Museum of Natural History, is a typical specimen of *Chordeiles virginianus minor* in the rufous, or rather tawny, phase. At present it has three old labels, the first of which bears the inscription, in George N. Lawrence' handwriting, "Chordeiles minor Cab. ♂ Cuba"; the second "Chordeiles gundlachii"; and on the reverse, "Type," also in Mr. Lawrence' chirography; and the third, "Chordeiles gundlachi Lawrence ♂ adultus." The name *Chordeiles gundlachii* should, of course, be synonymized with *Chordeiles virginianus minor*.

Specimens examined.—Total number 37, from the following localities in the West Indies:

Cuba.—San Diego de los Baños (Apr. 12, 16, and 18, 1900); Holguin (May 31, 1904; June 11, 1904; Aug. 2, 1905).

Isle of Pines.—Nueva Gerona (June 29 and 30, 1900; July 3 and 5, 1900); Hospital Spring (1904); Almacigos (Apr. 19, 1904); [no specific locality] (May 25, 1904).

Jamaica.—Hope Gardens, near Kingston (May 28, 1904); Phoenix Park, St. Ann Parish (July 25, 1865); Great Salt Pond, near Spanishtown (August, 1862); Bath (incubating female, July 7, 1902); Passage Fort, near Spanishtown (June, 1863); Mayfield, St. Andrew Parish (Apr. 18, 1879; June 25, 1874); Troy, 2,200 feet altitude (June 27, 1904).

Porto Rico.—[No further locality specified.]

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[1] *Chordeiles minor* Cabanis, Journ. f. Ornith., January, 1856, p. 5.

[2] Ann. Lyc. Nat. Hist. N. Y., vol. 6, December, 1856, p. 165.

Measurements of specimens of Chordeiles virginianus minor.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Am. Mus. N. H. 43839.[1]	Male[2]	Cuba			171	93	6.5	13.2	14
E. A. and O. Bangs 13687.[1]	do	Holguin, Cuba	Aug. 2, 1905	O. Tollin	173.5	94.5	8	14	14.2
E. A. and O. Bangs 14930.[1]	do	do	May 31, 1904	do	166	89	6.1	13	13
E. A. and O. Bangs 13446.[1]	do	Isle of Pines, West Indies.	May 25, 1904	W. R. Zappey.	159	89.5	6.9	13	14
U.S.N.M. 172785[1]	do	Nueva Gerona, Isle of Pines, West Indies.	June 29, 1900	W. Palmer and J. H. Riley.	166	96.5	6.5	12.5	13.5
U.S.N.M. 172786[1]	do	do	June 30, 1900	do	174	97.5	6.1	13.5	13.8
U.S.N.M. 172787[1]	do	do	do	do	170.5	92	6.2	14	14.2
U.S.N.M. 172790[1]	do	do	do	do	165	90	6.5	13.5	14
U.S.N.M. 172791[1]	do	do	do	do	166.5	96	7	14.1	14.2
U.S.N.M. 172792[1]	do	do	do	do	168	96.5	.....	13	14
U.S.N.M. 191526	do	Troy, Jamaica	June 27, 1904	W. R. Maxon.	171	94	6.8	13	13.8
U.S.N.M. 191525	do	Hope Gardens, Jamaica.	May 28, 1904	do	172.5	94	6.2	13.8	15
U.S.N.M. 106159	do	Phoenix Park, St. Ann Parish, Jamaica.	July 25, 1865	W. T. March.	176	94.5	5.7	13	13
A.N.S.Phila. 25624.	do	do	July —, 1865	do	178	95.5	5.8	13	14.2
A.N.S.Phila. 25660.	do	Great Salt Pond, near Spanishtown, Jamaica.	Aug. —, 1862	do	175.5	96	5.9	13	13.5
U.S.N.M. 172590[1]	Female	San Diego de los Baños, Cuba.	Apr. 12, 1900	W. Palmer and J. H. Riley.	170	94.5	7	13	13.1
U.S.N.M. 172594[1]	do	do	Apr. 16, 1900	do	168	98	6.9	13	13.5
U.S.N.M. 172591[1]	do	do	Apr. 18, 1900	do	166	94	6.9	14.1	13.8
U.S.N.M. 24278[1]	do	Cuba			174.5	103	6.3	13.2	14
E. A. and O. Bangs 14932.[1]	do	Holguin, Cuba	June 11, 1904	O. Tollin	172	100	6.8	13.2	14
E. A. and O. Bangs 13443.[1]	do	Almacigos, Isle of Pines.	Apr. 19, 1904	W. R. Zappey.	169	93.5	6	14	14.2
U.S.N.M. 172793[1]	do	Nueva Gerona, Isle of Pines, West Indies.	June 30, 1900	W. Palmer and J. H. Riley.	160	89.5	6.8	13.8	14
U.S.N.M. 172789[1]	do	do	do	do	165.5	90	7	13	14.9
U.S.N.M. 171769[1]	do	Porto Rico		W. Glassford	173	.....	7	12	13.2
U.S.N.M. 106158	do	Phoenix Park, St. Ann Parish, Jamaica.	July 25, 1865	W. T. March.	171	95.5	6	13.5	13.5
U.S.N.M. 188333	do	Bath, Jamaica	July 7, 1902	W. Robinson	171.5	100	6.5	13.8	13.8
U.S.N.M. 78201	do	Mayfield, St. Andrew Parish, Jamaica.	Apr. 18, 1879	E. Newton	171.5	95	6.5	13.5	14
U.S.N.M. 78200	do	do	June 25, 1879	do	165	96	6.2	13.5	13.2
Am. Mus. N. H. 43840.	do	Passage Fort, near Spanish town, Jamaica.	June —, 1863	W. T. March.	165	93	6	13.3	14.5

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[1] Used in measurement averages on p. 82.

[2] Type of *Chordeiles gundlachii* Lawrence.

No. of specimens.	Name of subspecies	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
12	*Chordeiles virginianus virginianus*	184	206	196	106	114	[illegible]	6.1	7.6	6.6	14.6	15.4	14.4	14	15.6	14.9
10	*Chordeiles virginianus hesperis*	183	211	200	107	120	112.9	6	8	6.9	14.8	15.2	14.3	14	15.5	14.7
10	*Chordeiles virginianus sennetti*	186	213	198.3	101.5	112.5	109.1	6	7.2	6.9	13.5	15.8	14.6	13.9	16	15.3
10	*Chordeiles virginianus howelli*	192.5	211	200	105	121	112.3	5.9	7	6.3	13	15.2	14.8	14.2	15.5	14.9
11	*Chordeiles virginianus henryi*	188	200.5	199.7	104	116.5	111.1	6.5	7.5	7	13.9	15.8	14.6	14	16.5	15
10	*Chordeiles virginianus aserriensis*	179	188	183.7	94.5	105	101.1	6	7.9	6.7	13.8	15.1	14.5	13	14.8	13.9
14	*Chordeiles virginianus chapmani*	178	192	184.1	99	110.5	105	4.8	7	6.3	12.5	15.5	13.9	13	15.8	14.2
10	*Chordeiles virginianus vicinus*	182.5	188	170.9	92	108	96.8	6.1	7.8	6.7	13	14.8	13.4	13	15	13.9
10	*Chordeiles virginianus minor*	180	174	166	90	97.5	98.5	6.1	8	6.6	12.8	14.1	13.4	13	14.2	13.9
	FEMALES.															
10	*Chordeiles virginianus virginianus*	187.5	208	190.5	105	118.5	112	6.2	7.9	6.7	13.8	15.5	14.8	14	16.8	15.5
10	*Chordeiles virginianus hesperis*	187	208	194.9	106	119	112.2	6.1	8	7	13	15.2	14.5	14.9	16	15.3
10	*Chordeiles virginianus sennetti*	175.5	201	190.5	102.5	115	108	6	7.5	6.5	13.8	15.3	14.7	14	16	14.9
10	*Chordeiles virginianus howelli*	185	208.5	193.4	104	122.5	112.8	6.5	7.2	6.9	13	14.8	14.2	14.6	16	15.3
12	*Chordeiles virginianus henryi*	183	198	190.5	102.5	117.5	110	6	7.5	6.6	12.5	14.8	14.1	13.2	16	14.7
10	*Chordeiles virginianus aserriensis*	179	185.5	182.7	98.8	106	102.6	6.8	7.5	6.9	13.5	14.8	14.2	14	15.5	14.4
10	*Chordeiles virginianus chapmani*	172.5	184.5	179.4	99	108.5	103.2	5	7.5	6.8	13.2	15	14	13.8	15.8	14.4
10	*Chordeiles virginianus vicinus*	180.5	184.5	173.2	91	102.5	97.7	6.1	7.5	6.7	12.5	14.8	13.4	13	15	14.1
9	*Chordeiles virginianus minor*	180	174.5	168.7	90.5	103	95.3	6	7	6.7	12	14.1	13.8	13.1	14.9	13.9

CHORDEILES ACUTIPENNIS (Boddaert).

Caprimulgus acutipennis BODDAERT, Tabl. Planch. Enlum. d'Hist. Nat., 1783, p. 46 (Guiana).[1]

Chars. sp. (*adult male*).—Interorbital region of skull somewhat narrower than in *Chordeiles virginianus;* longitudinal ridges on the median portion of frontal bones strongly developed; maxillo-palatines relatively rather narrower and more elongated than in *Chordeiles virginianus;* vomer rather broader than in *Chordeiles virginianus;* antero-external processes of the palatines decidedly slender, more so than in *Chordeiles virginianus;* pterygoids with no decided exterior angle near the anterior end, and the terminal portion approaching the palatine only at the point of articulation; first (outermost) primary *usually* shorter than the second; shortest secondary usually reaching or exceeding the tips of the primary coverts; distance from bend of folded wing to end of shortest secondary nearly always greater than from latter point to end of fourth primary (counting from the outermost); tips of most of rectrices usually somewhat squarish; upper surface dark brown or blackish, profusely mottled with white, buff or tawny; tail dark brown, irregularly barred, at least on middle feathers, with white, gray, or buff; wing-quills fuscous, the usually four, sometimes five, outer primaries crossed by a large white spot between the tips of the fifth and eighth primaries, the basal portion of primaries and whole of secondaries and primary coverts with conspicuous buff or ochraceous spots or bars; axillars and under wing-coverts buff or ochraceous, barred with brown; throat of male white; jugulum and breast dark brown, vermiculated and spotted with whitish, buffy or ochraceous; rest of lower surface buff or whitish, barred with dark brown.

Adult female.—Differs from the adult male in much smaller size; smaller, and wholly or largely buff instead of white wing-patch; absence of white subterminal bar on tail; more whitish or buffy mottling on terminal portion of tail, which, in the male, except for the middle pair of rectrices, is usually plain brown; generally more or less buffy throat-patch, which, however, in some individuals is almost as white as in the male; and average rather more ochraceous lower parts.

First autumn plumage.—This is practically the same in both male and female as that of the adults so far as the contour feathers are concerned, and otherwise differs only in having whitish or buffy tips on the primaries, secondaries, and rectrices. These light tips mostly wear off before the next molt, but usually persist sufficiently, at least on the shortest secondaries, to serve for the discrimination of year-old birds.

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[1] Further synonymy under the various subspecies.

Juvenal plumage.—In this plumage both sexes are decidedly lighter and more closely and evenly mottled than in the adult, particularly above. In the male the upper parts are also more uniform, with more ochraceous or gray and less black; the tail and wing-quills are broadly tipped with buff; the light bars of the tail are more deeply buff; the white throat-patch is more buffy; the lower surface duller, more ochraceous, more uniform, less distinctly and less broadly barred. The subterminal bar on the tail is white, about as in the adult.

The juvenal female differs from the adult female much as above detailed for the male, but somewhat less so. She is similar to the juvenal male, but has the light spot on the primaries smaller and more deeply buff or ochraceous buff, instead of white or slightly buffy; the light throat-patch more deeply buff, never whitish; and she lacks the subterminal white bar on the tail.

Very young birds, both male and female, before they are full grown, are above very pale buff, finely and sparingly spotted with black, and vermiculated with silvery gray; and below, pale buff, with narrow widely spaced bars of dusky or blackish.

Nestling plumage.—Upper surface fawn color, clouded or obscurely mottled with mars brown; lower parts fawn color, unmarked, but paling on the median portion of breast and abdomen.

Seasonal variation.—Of normal seasonal plumage variation not due to molt there is little or none; what there is consists in the occasional browning of the dark areas and the slight reduction of the light markings from abrasion of the feathers.

Molt.—From the fugitive natal plumage the young bird molts directly into the juvenal plumage, growing the while, so that at least by the time, often before, it has attained full size of body and wings, the juvenal plumage is complete. Then by a practically continuous molt, usually in September, it again changes its contour feathers, but retains the remiges and rectrices. The combination plumage of the first autumn is worn apparently until the following summer, when the regular sequence of adult molt is begun.

The adult of this species molts but once a year, usually between the last of July and the middle of September, most individuals chiefly in August, during which period all of the feathers, including remiges and rectrices, undergo a renewal. Subsequently, from January to July, the plumage becomes increasingly worn each month. Some birds are considerably worn even by January, but, like *Chordeiles virginianus*, they rarely, if ever, become badly tattered.

Individual variation.—In all the races of this species there is great individual variation in both size and color. Such differences of size appear in the tables of detailed measurements; those of color are at once evident on comparison of specimens. In adults these color variations consist in the darkness or lightness of the upper surface, due to the brownness or blackness of the dark areas, and particularly to the fineness and amount of the light mottling, together with the whitish, grayish, ochraceous, or tawny hue of these markings; depth or paleness of lower surface, and of its buffy, ochraceous, or tawny tinge; the width of the black bars on the posterior lower surface, and of the light bars on the tail; and the size of the light wing-spot.

In fact, so conspicuous and often coordinated are many of these differences, particularly those affecting the general coloration of upper and lower parts, that they form several more or less well-defined color phases, which are, however, more striking in some of the subspecies than in others. These phases really number four, though two of them are light and dark extremes of the gray and ochraceous, or tawny, phases. They are all more fully treated under *Chordeiles acutipennis acutipennis*,[1] in which race they are very well defined. It is interesting to note that, while in *Chordeiles virginianus* these buffy, ochraceous, or tawny variations are largely geographical, they are in the present species almost wholly individual. The gray and ochraceous phases of this species are almost if not quite as well marked in juvenal birds of all ages as in the adults, a proof, if any were needed, that these color phases are not due to age.

Geographical variation.—To the three subspecies of *Chordeiles acutipennis* currently recognized, two are now added, making thus five. All the races are wholly or mainly continental, and correspond fairly well to the characteristics exhibited by representatives of other species occupying the same areas. The typical wide-ranging South American *Chordeiles acutipennis acutipennis* is a small, dark race; the Peruvian *Chordeiles acutipennis exilis*, small and light; the Yucatan *Chordeiles acutipennis micromeris*,[2] of moderate size and rather pale coloration; the Lower California *Chordeiles acutipennis inferior*,[3] rather large and of light color; and *Chordeiles acutipennis texensis*, large and pale. It is noticeable also that the two southernmost forms—*Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis*—are the smallest, and that the size increases regularly northward through *Chordeiles acutipennis micromeris*[2] and *Chordeiles acutipennis inferior*,[3] reaching its maximum in the northernmost race, *Chordeiles acutipennis texensis*. In color the pale Peruvian

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[1] See pp. 96–97.
[2] See p. 100.
[3] See p. 109.

Chordeiles acutipennis exilis is much more like the widely separated Yucatan form, *Chordeiles acutipennis micromeris*,[1] than like the intervening and undoubtedly close ally, *Chordeiles acutipennis acutipennis.* Other than this, the geographical variations of this species present no peculiarities.

The five forms here treated under *Chordeiles acutipennis* are undoubtedly all subspecies, and the three heretofore recognized currently pass as such. The Peruvian *Chordeiles acutipennis exilis* doubtless intergrades geographically with *Chordeiles acutipennis acutipennis*, though we have seen no actual intermediates. Although *Chordeiles acutipennis micromeris*[1] has in the breeding season no geographical connection with *Chordeiles a. acutipennis*, its individual variation in both size and color bridges the gap between the characters of these two forms; while the same is practically true of *Chordeiles acutipennis micromeris*[1] and the much more widely separated *Chordeiles acutipennis exilis.* The northern *Chordeiles acutipennis texensis* passes into *Chordeiles acutipennis micromeris*[1] in southern Mexico, intergrading both geographically and individually; and similarly into *Chordeiles acutipennis inferior*[2] in southern California and extreme northern Lower California. Actual geographical intermediates are, however, few in the material examined, doubtless from lack of specimens from the particular localities where intergradation takes place; but intermediates due to individual variation are of frequent occurrence.

The characters which serve to separate the several subspecies consist largely in differences of size, principally of wing and tail, sometimes also of exposed culmen, tarsus, and middle toe; the colors and general tone of upper surface and lower parts, light or dark; the width of both the dark bars and the light interspaces on the posterior lower surface; and the width of the light bars on the tail.

Geographical distribution.—The breeding range of *Chordeiles acutipennis* as a species extends, in South America, from southern Brazil to Venezuela and Colombia, including, as well, the islands of Tobago and Margarita; also to British Honduras, Guatemala, Mexico, and the southwestern portion of the United States. It winters also in the remaining countries of Central America. The typical race, *Chordeiles acutipennis acutipennis*, occupies an area in South America approximately twice as great as the combined range of the four other subspecies. Of the latter, *Chordeiles acutipennis texensis* has a range of considerable extent; but *Chordeiles acutipennis exilis* and *Chor-*

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[1] See p. 100.

[2] See p. 109.

deiles acutipennis inferior[1] are comparatively local; while *Chordeiles acutipennis micromeris*[2] is somewhat restricted in distribution.

The ranges of the two South American forms, *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis*, seem to be practically continuous; but, so far as known, there is a wide gap between the northern breeding limit of *Chordeiles acutipennis acutipennis* in northwestern Colombia and the nearest point in the summer distribution of *Chordeiles acutipennis micromeris*[2] in Guatemala or British Honduras. By all the collecting that has been done in the intervening countries of Central America—Salvador, Honduras, Nicaragua, Costa Rica, and Panama, the last two particularly—not an actual breeding record has been obtained. If the species really does breed in any part of this area it must be very rare. The range of *Chordeiles acutipennis texensis* is continuous with that of both *Chordeiles acutipennis micromeris*[2] and *Chordeiles acutipennis inferior.*[1]

Zonal distribution.—In South America this species occupies the Lower Tropical Zone of the Neotropical Region; in Mexico the Lower Tropical, Upper Tropical, and Lower Austral zones, and in places part of the Upper Austral Zone; in the United States chiefly the Lower Austral Zone, but also parts of the Upper Austral Zone. Although the details of its zonal affinities are not very well known, particularly in South America, most of the subspecies seem to have fairly definite zonal distribution. Two races, *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis*, are apparently each confined to a single life zone; one, *Chordeiles acutipennis texensis*, to two zones; and each of the two other forms to three zones. In some cases a zone is not fully, even but little occupied, this being noted principally with regard to the Upper Austral Zone.

Phylogeny.—The South American origin of *Chordeiles acutipennis* may be taken almost for granted. Furthermore, that *Chordeiles acutipennis acutipennis* should be considered the primitive and parent form is indicated by its present South American distribution, its extensive range, its uniformity over this wide area, its lack of migration, and the relation of its characters of color and size to those of other subspecies. In western Peru it has been modified, in that more arid climate and consequently changed environment, into *Chordeiles acutipennis exilis*, a form of approximately the same size but more pallid coloration. The northwestward dispersal of the species has been through Central America and Mexico to the southwestern United

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[1] See p. 109.

[2] See p. 100.

States. In the last mentioned region there is no evidence that it formerly occupied a greater area than now; while on the other hand it seems at the present time to be, even if slowly, extending its range, particularly in Texas and California. For some reason not apparent it no longer breeds in Central America southeast of Guatemala, which hiatus may have aided in the differentiation of the northern colony. As expected, the Yucatan form, *Chordeiles acutipennis micromeris*,[1] is most closely allied to the parent race, *Chordeiles acutipennis acutipennis*, retaining the same tail markings but becoming larger, and otherwise modified by isolation and its more arid habitat. The northernmost race, *Chordeiles acutipennis texensis*, also of desert environment, is most nearly allied to *Chordeiles acutipennis micromeris*,[1] but still more modified, presenting the extreme of differentiation from the parent stock. The Lower Californian *Chordeiles acutipennis inferior*,[2] also a desert bird, is merely a depauperate form of *Chordeiles acutipennis texensis*, thus modified by semi-isolation and that peculiar but not well-understood influence which produces in southern Lower California so many small forms.

Migration.—The migration of *Chordeiles acutipennis* differs greatly from that of *Chordeiles virginianus*. Of the five races of the present species, two, *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis*, seem to be entirely sedentary. Another, *Chordeiles acutipennis inferior*, withdraws only from the more northern portions of the Lower California peninsula to its southern end. Although the comparatively few available specimens of *Chordeiles acutipennis micromeris* do not permit any careful analysis of its migratory movements, we know enough to show that its route lies through Central America to its winter home in Costa Rica and Panama.

The northern *Chordeiles acutipennis texensis* has the greatest migration range of all the forms of the species. It passes from the southwestern United States to extreme eastern Panama. Its route both southward and northward seems to be entirely overland, through Mexico and Central America. It appears in spring in the southwestern United States usually some time in April, though during some years in certain localities not until the middle of May, but exceptionally as early as March 21. It leaves this country ordinarily in September, but lingers on rare occasions as late as October 23. The normal migration movement thus extends over about two months during both spring and autumn.

Habits.—In many of its habits *Chordeiles acutipennis* resembles *Chordeiles virginianus*. It is, however, more crepuscular, does not have the high, booming flight, and has different notes. It is fond of the chaparral, groves, gravelly or rocky mesas, valleys, slopes, canyons, bottomlands, and other kinds of open country. Its flight, though strong and graceful, is usually rather low. Its notes, uttered both on the wing and while the bird is at rest, are peculiar, and difficult of description, some of them not distantly resembling the call of a little owl. This nighthawk is often gregarious, and large numbers sometimes congregate, usually during the migration seasons. Its food consists of lepidoptera and various other insects, captured largely on the wing, though also by hopping after them on the ground.

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[1] See p. 100.

[2] See p. 109.

This species builds no nest, but lays its eggs on the ground, even though bare, hard, stony, or gravelly, and usually in a more or less exposed situation, although sometimes at the base of a bush. One or two broods are reared; and in the United States the earliest recorded date for eggs is April 27, the latest, August 6. The eggs are two in number, pale grayish or whitish, finely dotted and otherwise marked over the whole surface with lilac, various shades of gray, drab, and slate color. The female often remains on the eggs until almost touched.

History.—The earliest account of the species is apparently that of Buffon,[1] who, in 1779, described the bird from Guiana under the name "L'Engoulevent acutipenne de la Guyane." Upon this description and the accompanying plate by d'Aubenton,[2] Boddaert in 1783 based his name *Caprimulgus acutipennis.*[3] This same subspecies was subsequently diagnosed as new, twice by Gmelin,[4] and still more recently no less than six times by various other authors.[5] Not until 1839 was another valid form described, when the bird of (Chile and) western Peru was named *Caprimulgus exilis* by Lesson.[6] The same race was later redescribed twice by Tschudi,[7] and once by Peale.[8] The Texas bird was made known as *Chordeiles texensis* by George N. Lawrence in 1856,[9] though at that time its real relationship with *Chordeiles acutipennis* was not suspected. The two additional subspecies in the present paper result from the separation of the Lower California bird as *Chordeiles acutipennis inferior*,[10] and the bird from Yucatan and southern Mexico as *Chordeiles acutipennis micromeris.*[11]

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[1] Hist. Nat. des Oiseaux, orig. ed., vol. 6, 1779, pp. 547–548.

[2] Planch. Enlum. d'Hist. Nat., No. 732.

[3] Tabl. Planch. Enlum. d'Hist. Nat., 1783, p. 46.

[4] *Caprimulgus brasilianus*, Syst. Nat., vol. 1, pt. 2, 1789, p. 1031; *Caprimulgus acutus*, ibid.

[5] See p. 94.

[6] Rev. Zool., 1839, p. 44.

[7] See p. 98.

[8] United States Explor. Exped., vol. 8, Mamm. and Ornith., 1848, p. 172.

[9] Ann. Lyc. Nat. Hist. N. Y., vol. 6, December, 1856, p. 167.

[10] See p. 109.

[11] See p. 100.

CHORDEILES ACUTIPENNIS ACUTIPENNIS (Boddaert).

Caprimulgus acutipennis BODDAERT, Tabl. Planch. Enlum. d'Hist. Nat., 1783, p. 46 (Guiana) (based on *Crapaud-volant ou Tette-chevre, de la Guiane*, D'AUBENTON, Planch. Enlum. d'Hist. Nat., No. 732; and *L'Engoulevent acutipenne de la Guyane*, BUFFON, Hist. Nat. des Oiseaux [ed. Montbeillard [1]], vol. 12. 1780, p. 264; orig. ed., vol. 6. 1779, p. 547 [Guiana]).

[*Caprimulgus*] *brasilianus* GMELIN, Syst. Nat., vol. 1, pt. 2, 1789, p. 1031 (Brazil).

[*Caprimulgus*] *acutus* GMELIN, Syst. Nat., vol. 1, pt. 2, 1789, p. 1031 (Guiana).

Caprimulgus noitibo VIEILLOT, Nouv. Dict. d'Hist. Nat., 2d ed., vol. 10, 1817, p. 241 (Brazil).

C[*aprimulgus*]. *brasilianus* VIEILLOT, Tabl. Encyc. Méth. Ornith., vol. 2, 1823, p. 542 (Brazil).

C[*aprimulgus*]. *semitorquatus* WIED, Beiträge Naturg. Bras., vol. 3, 1830, p. 330 (Brazil) (nec *Caprimulgus semitorquatus* Gmelin, qui *Lurocalis semitorquatus* Auct.).

Chordeiles labeculatus JARDINE, Ann. and Mag. Nat. Hist., ser. 1, vol. 18, 1846, p. 118 (Tobago).

[*Chordeiles*] *sapiti* BONAPARTE, Consp. Gen. Avium, vol. 1, 1850, p. 63 (South America) (ex Natterer MS.).

Caprimulgus stenopterus PELZELN, Ornith. Bras., 1 Abth., 1868, p. 14, note (Bahia, Brazil).

Chars. subsp.—Size small; lower parts relatively dark and heavily barred; light bars on tail-feathers narrow; upper parts mostly brownish or buffy, and rather dark.

Description.—Adult male, in the light gray phase, No. 34355, Carnegie Museum; San Felix, Venezuela, June 16, 1910; M. A. Carriker, jr.; original number, 7507. Upper parts light brownish gray, with in places a slight tinge of buff, particularly on the scapulars, and mottled, vermiculated, and irregularly barred with brownish black, the pileum nearly all brownish black, the scapulars solid black medially, the lower cervix duller and more uniform; tail fuscous, more or less irregularly and rather narrowly barred with cream buff and whitish, these bars on the upper side of tail much mottled and broken with fuscous; a much broader subterminal pure white bar; wing-quills fuscous, all but the outer primaries spotted or barred on both webs with tawny, ochraceous or buff, having also a broad white bar on four outer primaries mostly posterior to the tip of the eighth primary; wing-coverts and tertials mottled, spotted, and vermiculated with white and buffy like the back; edge of wing along the alula mostly buffy or creamy white; lores and supraocular region mixed white and blackish brown; auriculars and postocular region blackish brown, much mixed with tawny ochraceous and a little with white; cheeks, chin, and sides of neck, blackish brown, much mingled with white and buffy; a large triangular patch on throat white; below this a band of dark brown much spotted with tawny ochraceous; breast dark brown, finely mottled and vermiculated with whitish; lower breast cream white, with conspicuous dark brown cross-bars; abdomen, sides, flanks, and crissum, buff or whitish, with conspicuous dark brown cross-bars, these narrower, farther apart, and somewhat broken on lower tail-coverts; lining of wing deep ochraceous buff, barred with dark brown. "Iris brown; feet dusky flesh; bill brownish black."

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[1] This is the edition of Buffon that Boddaert cites all through his "Table des Planches Enluminéez d'Histoire Naturelle de M. d'Aubenton." The portion of this edition (18 volumes) relating to birds appeared from 1770 to 1785. In my recent paper on *Butorides virescens* (Proc. U. S. Nat. Mus., vol. 42, 1912, pp. 533 and 564), I inadvertently credited two of Boddaert's references to the Deux Ponts edition, which references should, of course, read "ed. Montbeillard." Suckow, however, in his "Anfangsgrunde der theoret. und angewandt. Naturgeschichte der Thiere," 1797–1801, regularly cites the Deux Ponts edition. Gmelin, in his "Systema Naturae," uses the original quarto edition.

Iris brown; bill black or brownish black; feet dusky flesh color or brownish.

Measurements.—Male: Total length (in flesh), 198–203 (average 201) mm.[1]

Male:[2] Wing, 150.5–172 (average, 163) mm.; tail, 84–102 (93.6); exposed culmen, 4.8–6.8 (5.8); tarsus, 11.5–14 (12.6); middle toe, 12.1–15 (13.6).

Female:[3] Wing, 147.5–169 (160) mm.; tail, 86.5–99 (92.7); exposed culmen, 4.5–6.1 (5.3); tarsus, 11.5–14 (12.7); middle toe, 12–14.7 (13.4).

Type-locality.—Cayenne, French Guiana.[4]

Geographical distribution.—Northern, central, and central eastern South America. Permanently resident in the Lower Tropical Zone, north to Tobago Island; Margarita Island, Venezuela; Cumana, Caracas, and Encontrados (Zulia), northern Venezuela; and Cartagena, northern Colombia; west to Cartagena in northern, and Rio San Juan Oscuro in western, Colombia; Guayaquil, western Ecuador; Santa Lucia (mouth of Tumbez River), northwestern Peru; and Matto Grosso, central western Brazil; south to Matto Grosso; and to Itapura and Iguape in Sao Paulo, southeastern Brazil; east to Iguape, Rio de Janeiro, Bahia, Pernambuco, and Para, eastern Brazil; Cayenne, French Guiana; Surinam; Quonga and Aunai, British Guiana; Trinidad Island; and the island of Tabago.

Remarks.—With present material it is impossible to recognize in South America more than the two current races of this species, *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis exilis* (=*pruinosus*). Compared with birds from Guiana, those from

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[1] Three specimens.

[2] Eleven specimens, from Venezuela and Guiana.

[3] Ten specimens, from Venezuela, British Guiana, French Guiana, and Brazil.

[4] Designated by Berlepsch and Hartert, Novit. Zool., vol. 9, 1902, p. 90.

Maripa, on the Rio Caura, Venezuela, seem to average somewhat more grayish (less ochraceous) on the light areas of the upper surface, while the dark areas are not quite so brownish. Two specimens from Encontrados (Zulia), Venezuela, are much more blackish above than either the series from Guiana or Maripa; and one from the Rio San Juan Oscuro, Colombia (No. 71705, Amer. Mus. Nat. Hist.), is even darker, and also more ochraceous above and below. None of these color differences, however, appear to be more than individual. Specimens from Cayenne and British Guiana are in color like those from Brazil; and one from Margarita Island, Venezuela, is just the same. Nor am I able to distinguish from Venezuela birds a single example from Guayaquil, Ecuador (No. 21992, Acad. Nat. Sci. Phila). Specimens from different parts of the range of *Chordeiles acutipennis acutipennis* average as follows:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Nine males, from Venezuela	164.4	94.6	6.1	12.8	13.7
Two males, from the Guianas	156.8	89	4.9	12	13.1
Three females, from Venezuela	159.7	93.7	6	13.7	12.9
Five females, from British Guiana and French Guiana	157.3	90.4	4.9	12	12.9
One female, from Brazil	168.5	95.2	4.5	13	14

It will be noticed that the birds from the Guianas average smaller than those from other localities, but this is possibly due to the smallness of the series.

Individual variation in size is very great, as the table of detailed measurements will show. Likewise there is a wide range of color difference, unattributable to sex, age, or season. In some cases the white subterminal tail-bar of the male is practically absent. There are also two, or rather four, styles of plumage, or phases, as they doubtless really are; a gray, and an ochraceous or tawny phase, each of these with a light and dark extreme. All these are connected by various intermediates. These phases are not so strongly marked as the red and gray plumages of *Otus asio*, but are nevertheless readily recognizable, although birds in the extremes of these phases seem to be uncommon. Gray birds seem to be the more numerous. In the gray phase the upper surface almost entirely lacks rufous and ochraceous, most of the light areas being white or grayish; and the lower parts have the ochraceous confined to the jugulum, and the buff of the remaining inferior area to the posterior portion. In the ochraceous phase the blackish areas above are somewhat more brownish and the light areas mostly tinged with ochraceous or buff; the lower parts are strongly tinged with ochraceous or tawny throughout; and the tail-bars are more deeply ochraceous. The light extreme of both gray and ochraceous phases is characterized by a general reduction of the black areas on the upper parts and a consequent increase of light areas, and by narrower black bars on the posterior lower surface. The dark extreme of both phases has much black above and heavier black bars and mottling below.

The full-grown young bird in gray phase first autumn plumage is superficially very similar to the corresponding stage of *Chordeiles virginianus hesperis*, but it is more finely mottled above, is smaller, and, of course, readily distinguishable by the position of the white or buff patch on the wing-quills.

The earliest name for any form of this species is *Caprimulgus acutipennis* Boddaert,[1] which has for its basis the "Crapaud-volant ou Tette-chevre, de la Guiane" of d'Aubenton;[2] and "L'Engoulevent acutipenne de la Guyane" of Buffon,[3] both of which apply exclusively to the bird from the Guianas. Berlepsch and Hartert have further restricted the type-locality to Cayenne, French Guiana.[4] The next name to be applied to this race is *Caprimulgus brasilianus* Gmelin,[5] the type-locality of which is Brazil. Should it, therefore, ever become advisable to separate subspecifically the Brazilian bird from that of the Guianas, as is possible on account of its apparently greater size, its name will be *Chordeiles acutipennis brasilianus* (Gmelin). The remaining synonyms of *Chordeiles acutipennis acutipennis* need no further elucidation; but it may be well to mention that *Caprimulgus hirundinaceus*,[6] which usually appears in the synonymy of *Chordeiles acutipennis*, Mr. C. E. Hellmayr has found to be a distinct species of an entirely different genus.[7] He considers it a member of the genus *Caprimulgus*, but the characters he gives in his text and figures show that it without doubt belongs to Mr. Robert Ridgway's new genus *Nyctipolus*[8] and should therefore stand as *Nyctipolus hirundinaceus* (Spix).

Specimens examined.—Thirty-one specimens have been seen, from the following localities:

Brazil.—Bahia; Anjos.

British Guiana.—Aunai (June 7, 1890; May 14 and 20, 1890).

Colombia.—Rio San Juan Oscuro (June, 1898).

Ecuador.—Guayaquil.

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[1] Tabl. Planch. Enlum. d'Hist. Nat., 1783, p. 46.

[2] Planch. Enlum. d'Hist. Nat., No. 732.

[3] Hist. Nat. des Oiseaux [ed. Montbeillard], vol. 12, 1780, p. 264; orig. ed., vol. 6, 1779, p. 547.

[4] Novit. Zool., vol. 9, 1902, p. 90.

[5] Syst. Nat., vol. 1, pt. 2, 1789, p. 1031.

[6] Spix, Avium Spec. Nov. Bras., vol. 2, 1825, p. 2, pl. 3, fig. 1 (Solimoëns River, Brazil).

[7] See Hellmayr, Abhandl. Math.-Phys. Klasse Königl. Bayer. Akad. Wiss., vol. 22, 1906, p. 636.

[8] *Nyctipolus* Ridgway, Proc. Biol. Soc. Wash., vol. 25, May 4, 1912, p. 98 (type, *Caprimulgus nigrescens* Cabanis).

French Guiana.—Cayenne.

Venezuela.—Maripa, Rio Caura (Apr. 23 and 24, 1901; Feb. 3, 1903; Dec. 28, 1909); Margarita Island (July 2, 1895); Encontrados, Zulia (Feb. 20 and 24, 1908); San Felix (June 16, 1910).

Measurements of specimens of Chordeiles acutipennis acutipennis.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Carnegie Mus. 33141.[1]	Male....	Maripa, Rio Caura, Venezuela.	Dec. 28, 1909	M. A. Carriker, jr.	172	102	5.1	12.3	13.5
Am. Mus. N. H. 75450.[1]	...do....	.....do...........	Apr. 23, 1901	S. M. Klages	163	95	6.1	13.5	13.5
Am. Mus. N. H. 75452.[1]	...do....	.....do...........	.....do......	.....do......	168	97	6.8	13.8	13.2
Am. Mus. N. H. 75449.[1]	...do....	.....do...........	.....do......	.....do......	150.5	84	6.1	11.9	13
Am. Mus. N. H. 75453.[1]	...do....	.....do...........	Apr. 24, 1901	.....do......	162.5	91	6.5	13	14.5
Field Mus. N. H. 34535.[1]	...do....	Encontrados, Zulia, Venezuela.	Feb. 24, 1908	N. Dearborn	164.5	93.5	6.2	13	13.5
Field Mus. N. H. 34532.[1]	...do....	.....do...........	.....do......	.....do......	162.5	91.5	4.8	14	15
U.S.N.M. 151667[1].	...do....	Margarita Island, Venezuela.	July 2, 1895	W. Robinson.	168	101	6.2	11.5	13.8
Carnegie Mus. 34355.[1]	...do.[2]..	San Felix, Venezuela.	June 16, 1910	M. A. Carriker, jr.	169	96.5	6.7	12	13
A. N. S. Phila. 50514.[1]	...do....	Aunal, British Guiana.	June 7, 1890	H. Whitely.	156.5	88	4.8	12	14
Am. Mus. N. H. 43848.[1]	[Male]...	Guiana..........	....	....	157	90	5	12	12.1
A. N. S. Phila. 21992.	...do....	Guayaquil, Ecuador.	....	W. S. W. Ruschenberger.	167	99	4.5	13	12
Am. Mus. N. H. 75451.[1]	Female.	Maripa, Rio Caura, Venezuela.	Apr. 23, 1901	S. M. Klages.	147.5	87.5	6	13.5	13
Field Mus. N. H. 34536.[1]	...do....	Encontrados, Zulia, Venezuela.	Feb. 20, 1908	N. Dearborn	162.5	94.5	6	13.5	14
Field Mus. N. H. 34533.[1]	...do....	.....do...........	Feb. 24, 1908	.....do......	169	99	6.1	14	14.7
A. N. S. Phila. 50509.[1]	...do....	Aunal, British Guiana.	June 7, 1890	H. Whitely.	162.5	92	.....	11.5	12.5
A. N. S. Phila. 50510.[1]	...do....	.....do...........	.....do......	.....do......	156.5	87	4.5	13	14
A. N. S. Phila. 50513.[1]	...do....	.....do...........	.....do......	.....do......	151	86.5	5	12	12.3
A. N. S. Phila. 50511.[1]	...do....	.....do...........	May 20, 1890	.....do......	156	92.5	5	11.5	12
Am. Mus. N. H. 43847.[1]	[Female]	Cayenne, French Guiana.	....	....	160.5	94	5	12	13
Am. Mus. N. H. 43849.[1]	...do....	Bahia, Brazil.....	....	A. de Lacerda.	168.5	95.2	4.5	13	14
A. N. S. Phila. 21991.[1]	...do....	South America...	....	....	166	99	6	12.7	13.5

[1] Used in measurement averages on p. 95.

[2] Specimen described on p. 94.

CHORDEILES ACUTIPENNIS EXILIS (Lesson).

Caprimulgus exilis Lesson, Rev. Zool., 1839, p. 44 (Chile).

C[*aprimulgus*]. *pruinosus* Tschudi, [Wiegmann's] Archiv für Naturg., 1844, p. 268 (Peru) (Lichtenstein MS.).

Ch[*ordiles*]. *semitorquatus* Tschudi, Untersuch. Fauna Peruana, Ornith., 1846, p. 130 (text to plate) (Peru).

C[*hordiles*]. *prumosus* [err. typ. pro *Chordiles pruinosus*] Tschudi, Untersuch. Fauna Peruana, Ornith., 1846, p. 130.

Chordeiles peruvianus Peale, United States Explor. Exped., vol. 8, Mamm. and Ornith., 1848, p. 172 (Callao, Peru).

Chars. subsp.—Similar to *Chordeiles acutipennis acutipennis*, but upper surface paler and averaging rather less grayish, more brownish in general effect; lower parts paler, the dark bars of a lighter brown, somewhat narrower, and noticeably farther apart with consequently broader white interspaces; light bars on tail broader and on under side averaging paler; chest and jugulum lighter.

Measurements.—Total length (in flesh), 195–208 mm.; extent of wing, 457–488.

Male:[1] Wing, 155–162 (average, 158.5) mm.; tail, 95–96.5 (95.8); exposed culmen, 4.2–4.3 (4.3); tarsus, 13.7–14.3 (14); middle toe, 12.3–12.8 (12.6).

Type-locality.—Northern Chile.

Geographical distribution.—Permanently resident in the Lower Tropical Zone of the Pacific slope of central South America, north to Callao and Lima, central western Peru, and south, probably, to northern Chile.

Remarks.—This race is almost unique in its paleness below, which is due to the width of the light interspaces and to their whiteness. An unfortunately small series has been available, but the subspecies is evidently a good one, though it occupies a very restricted geographical area. A single juvenal male skin of ancient make, said to be from Bolivia, was probably obtained somewhere within the present confines of Chile, though the territory may have owed allegiance to Bolivia when this specimen was procured.

The first autumn plumage of *Chordeiles acutipennis exilis* is similar to that of *Chordeiles acutipennis acutipennis* in the gray phase, but is much paler, more silvery above; lighter, more grayish, and more finely vermiculated on the jugulum. In color of both upper and lower parts it is almost exactly like first autumn *Chordeiles virginianus sennetti*, though slightly more buffy on the posterior portion of the ventral surface, and, of course, smaller, with the light spot on the wing-quills nearer their ends.

This race is commonly known as *Chordeiles acutipennis pruinosus*,[2] but an earlier name is found in *Caprimulgus exilis* of Lesson.[3] This without any reasonable doubt is applicable to the pale bird from Peru; and the main reason for its rejection hitherto has been its type locality of "Chile." The northern part of this country is still imperfectly known ornithologically, and the occurrence of this bird there is at least probable, even within what was formerly the northern boundary of that country. At any rate, the description is a good one, and the name is tenable even if the assigned type-locality be erroneous.

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[1] Two specimens, from Peru.

[2] *Caprimulgus pruinosus* Tschudi, [Wiegmann's] Archiv für Naturg., 1844, p. 268 (Peru) (Lichtenstein MS.).

[3] Rev. Zool., 1839, p. 44.

Specimens examined.—Four specimens seen, from the localities below:

"*Bolivia.*"[1]—[No further locality specified.]

Peru.—Lima; Callao.

Measurements of specimens of Chordeiles acutipennis exilis.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 14026[2]	Male	Callao, Peru		T. R. Peale	162.	95	4.2	13.7	12.3
U.S.N.M. 39935[2]	do	Lima, Peru		W. S. Church	155.	96.5	4.3	14.3	12.8

[2] Used in measurement averages on p. 99.

CHORDEILES ACUTIPENNIS MICROMERIS, new subspecies.

Chars. subsp.—Resembling *Chordeiles acutipennis acutipennis*, but larger; upper parts not so dark; lower surface paler throughout, the chest and jugulum of a lighter brown, the brown bars on posterior portion lighter and somewhat narrower, the white interspaces wider, particularly on anal region; white subterminal bar on rectrices of male averaging wider.

Description.—Type, adult male, No. 213142, U.S.N.M.; Xbac, Yucatan, Mexico, April —, 1910; George F. Gaumer; original number, 289A. Upper parts light brownish gray, with a more or less evident tinge of buff, particularly on the scapulars, and mottled, vermiculated, and irregularly barred with brownish black, the pileum nearly all brownish black, the scapulars more or less solid black medially, the lower cervix duller and more uniform; tail-feathers fuscous, more or less irregularly and rather narrowly barred with cream buff and whitish, these bars on the upper side of tail much mottled and broken with fuscous; a much broader subterminal pure white bar; wing-quills fuscous, all but the outer primaries more or less spotted or barred on both vanes with tawny, ochraceous or buff, having also a broad white bar on four outer primaries mostly posterior to the tip of the eighth primary; wing-coverts and tertials mottled, spotted, and vermiculated with white and buffy, much like the back; edge of wing along the alula mostly buffy or creamy white; lores and supraocular region mixed white and blackish brown; auriculars and postocular region blackish brown, much mixed with tawny ochraceous, and a little with white; chin buffy grayish, the posterior lateral portion heavily marked with dark brown; cheeks and sides of neck blackish brown, much mingled with white and buffy; a large triangular patch on throat white; below this a band of dark brown, much spotted with ochraceous buff; breast dark brown, finely mottled and vermiculated with whitish; lower breast cream white, with conspicuous dark brown cross-bars; abdomen, sides, flanks, and crissum, ochraceous buff, with conspicuous dark brown cross-bars, these narrower, farther apart, and somewhat broken on lower tail-coverts; lining of wing deep ochraceous buff, barred with dark brown.

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[1] Doubtless from some locality now within the boundary of Chile.

Iris dark brown; bill brownish; feet dull brownish.

Measurements.—Male: Total length (in flesh), 200 mm.[1]

Male:[2] Wing, 161.5–176 (average, 169.4) mm.; tail, 92.5–102.5 (99.1); exposed culmen, 5.0–6.2 (5.7); tarsus, 12.5–13.8 (13.3); middle toe, 14–14.7 (14.4).

Female:[2] Wing, 158.5–168 (162.1) mm.; tail, 90–98.5 (94.4); exposed culmen, 5.0–6.5 (5.8); tarsus, 12–14 (13.1); middle toe, 13–15.3 (14.1).

Type-locality.—Xbac, Yucatan, Mexico.

Geographical distribution.—Central America and southern Mexico. Breeds in the Lower Tropical, Upper Tropical, and Lower Austral zones of Guatemala, British Honduras, Yucatan, and other parts of southern Mexico: north to Rio Lagartos, and Merida, Yucatan; Campeche, Campeche; Montecristo, Tabasco; Pelenque, Chiapas; and San Mateo, Oaxaca; northwest along the Pacific slope of Mexico to Colima; Zapotlan and Atemajac (near Guadalajara), Jalisco; south to Tuxtla Gutierrez, and San Bartolomé, Chiapas; and Coban, Guatemala; east to British Honduras; and Mujeres Island, eastern Yucatan. In migration southeast through Honduras, Nicaragua, and Costa Rica, to Gatun, in the Canal Zone, Panama. Winters in Panama and Costa Rica, possibly also in other and more northwestern parts of Central America. Not known from South America.

Remarks.—This form differs from *Chordeiles acutipennis exilis* in larger size; rather darker lower parts, the white interspaces on posterior portion being narrower; somewhat darker, more brownish general effect of the upper surface; and in darker, more ochraceous or buffy (less whitish) light bars on the under side of the tail.

Specimens from Costa Rica and Nicaragua and one from Panama (Gatun, Canal Zone, No. 207668, U.S.N.M.) appear to be exactly the same as those from Yucatan and Chiapas, and are doubtless immigrants, as there seems to be no breeding record of this species for Panama, Costa Rica, Nicaragua, Honduras, or Salvador.

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[1] One specimen.

[2] Seven specimens, from Yucatan, Mexico.

Breeding birds from Yucatan and Campeche represent the extreme differentiation of this subspecies. Those from southern Chiapas, from Guatemala, and southern Oaxaca, Mexico, are intermediate in size between *Chordeiles acutipennis micromeris* and *Chordeiles acutipennis texensis*, though in other respects like the former. A single female from Atemajac, Jalisco, near Guadalajara (No. 281892, U.S.N.M.), looks just the same as these intermediate birds from Oaxaca and Chiapas, and is the basis for extending the range of the present subspecies to Jalisco. This is probably correct, though the possibility, of course, exists that this individual is not representative of the birds breeding in Jalisco. Comparative average measurements of specimens from different localities are as below:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Seven males, from Yucatan	169.4	99.1	5.7	13.3	14.4
Two males, from Chiapas (Mexico), and Guatemala	178.5	104.3	5.6	13.3	15.3
Two males, from Costa Rica and Panama	167.8	99	6.5	13.8	14.8
Seven females, from Yucatan	162.1	94.4	5.8	13.1	14.1
One female, from Campeche	163.5	91.5	5.8	14	15
Two females, from Chiapas and Jalisco, Mexico	168.8	100	6	12.9	13.1

In this Yucatan race there exist the same four adult plumage phases as in *Chordeiles acutipennis acutipennis*.

Specimens examined.—Of this race 25 examples have been handled, from the subjoined localities:

Campeche.—Campeche (June 8, 1900).

Chiapas.—Tuxtla Gutierrez (May 26, 1904); San Bartolomé (Mar. 24, 1904).

Jalisco.—Atemajac (north of Guadalajara) (May 28, 1892).

Oaxaca.—San Mateo (Aug. 5, 1869).

Yucatan.—Rio Lagartos (Apr. 10, 14, 18, and 20, 1893), Mujeres Island (Mar. 24, 1901); Merida (June 19, 1865); Chichen Itza (Apr. 2, 1904); Izamal (June, 1905); Xbac (April, 1910).

Costa Rica.—San José (Sept. 10, 1883; Oct. 29, 1891); Pigres (Mar. 4 and 11, 1905).

Guatemala.—Lake Atitlan (Apr. 8, 1906).

Honduras.—Truxillo (Sept. 30, 1887).

Nicaragua.—San Geronimo, Chinandega (Mar. 25, 1904).

Panama.—Gatun, Canal Zone (Jan. 11, 1911).

Measurements of specimens of Chordeiles acutipennis micromeris.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 213142[1].	[Male][2]..	Xbac, Yucatan, Mexico.	Apr.—, 1910	G. F. Gaumer.	169	101	5.8	13.5	14.7
G. F. Gaumer 289A.[1]	Male....	.....do............	.....do......	.....do......	168	102.5	5.5	12.5	.....
G. F. Gaumer 289[1].	[Male]...	.....do............	.....do......	.....do......	169	96.5	6.2	12.8	.....
G. F. Gaumer 289B.[1]	Male....	.....do............	———, 1910	.....do......	167	99	5.5	13.5	.....
E. A. and O. Bangs 4419.[1]	...do....	Rio Lagartos, Yucatan, Mexico.	Apr. 14, 1893	W. W. Brown, jr.	161.5	92.5	5	13.8	14.7
U.S.N.M. 167421[1].	...do....	Mujeres Island, Yucatan, Mexico.	Mar. 24, 1901	E. W. Nelson and E. A. Goldman.	175	101	5.8	13.5	14
U.S.N.M. 130205[1].	[Male]...	Yucatan.........	....	G. F. Gaumer.	176	101.5	6	13.8	14
Field Mus. N. H. 22582.	Male....	Lake Atitlan, Guatemala.	Apr. 8, 1906	N. Dearborn	178	103.5	5.1	13	15
U.S.N.M. 193879...	...do....	San Bartolomé, Chiapas, Mexico.	Mar. 24, 1904	E. W. Nelson and E. A. Goldman.	179	105	6	13.5	15.5
U.S.N.M. 207668...	...do	Gatun, Canal Zone, Panama.	Jan. 11, 1911	E. A. Goldman.	167	101	6.8	14.5	15.1
E. A. and O. Bangs 16930.	...do....	San José, Costa Rica.	Sept. 10, 1883	C. F. Underwood.	168.5	97	6.1	13	14.5
G. F. Gaumer 288A.[1]	Female .	Izamal, Yucatan, Mexico.	June—, 1905	G. F. Gaumer.	162	94	6	12.5	.....
G. F. Gaumer 288[1].	...do....	.....do............	.....do......	.....do......	161	98.5	5	12	.....
Field Mus. N. H. 13247.[1]	.. do....	Rio Lagartos, Yucatan, Mexico.	Apr. 18, 1893	W. W. Brown, jr.	168	97.5	6	13.5	14.3
E. A. and O. Bangs 4418.[1]	...do....	.....do............	Apr. 20, 1893	.....do......	158.5	92.5	5.2	14	15.3
Am. Mus. N. H. 43854.[1]	...do....	Yucatan, Mexico.	....	G. F. Gaumer.	163.5	94.5	6	14	14
U.S.N.M. 213143[1].	[Female]	Izamal, Yucatan, Mexico.	June—, 1905	.....do......	162	93.5	6.5	13	14
U.S.N.M. 130208[1].	...do....	Yucatan, Mexico.	....	.....do......	160	90	6	13	13
U.S.N.M. 166707 ..	Female .	Campeche, Campeche, Mexico.	June 8, 1900	E. W. Nelson and E. A. Goldman.	163.5	91.5	5.8	14	15
U.S.N.M. 193880...	...do....	Tuxtla Gutierrez, Chiapas, Mexico.	May 26, 1904	.....do......	170.5	97.5	6	12.8	12.8
U.S.N.M. 154757...	...do....	Atemajac, Jalisco, Mexico.	May 28, 1892	.....do......	167	102.5	6	13	13.3

[1] Used in measurement averages on p. 101.

[2] Type.

CHORDEILES ACUTIPENNIS TEXENSIS Lawrence.

Chordeiles texensis LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol 6, December, 1856, p. 167 (Texas).

Chars. subsp.—Like *Chordeiles acutipennis inferior*,[3] but larger. Iris bluish black; bill black; feet gray or "purplish."

Measurements.—Male: Total length (in flesh), 215.9–248 (average, 230.2) mm.;[4] extent of wing, 520.7–581 (555.7).[5]

Female: Total length (in flesh), 215.9–228.6 (221.2);[6] extent of wing, 514.4–552.5 (532.6).[7]

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[3] See p. 109.

[4] Thirty-two specimens.

[5] Twenty-five specimens.

[6] Eighteen specimens.

[7] Eleven specimens.

Male:[1] Wing, 173–192 (average, 183.4) mm.; tail, 104–119 (111.6); exposed culmen, 5.0–6.8 (5.9); tarsus, 13–15 (14); middle toe, 13–15 (14.2).

Female:[1] Wing, 168.5–180 (175) mm.; tail, 102–110 (106.1); exposed culmen, 5.1–7.0; (6.0); tarsus, 12.5–15.2 (13.5); middle toe, 13–15.8 (14.2).

Type-locality.—Ringgold Barracks,[2] near Rio Grande City, Texas.

Geographical distribution.—The southwestern United States, Mexico, and all of Central America. Breeds in the Lower Austral, Upper Austral, and Upper Tropical zones of the southwestern United States, northern and central Mexico (excepting southern Lower California): north to Kerrville and Pecos City, middle Texas; Alamagordo, Deming, and Lone Mountain (Grant County), southern New Mexico; the Santa Catalina Mountains, southeastern Arizona; Fort Verde, central Arizona; Beaverdam, northwestern Arizona; St. George, southwestern Utah; Virgin Valley, Vegas Valley, and Ash Meadows, southern Nevada; Bishop (Owens Valley), Chinese Camp (Tuolumne County), Marysville, Winslow (Glenn County), and Ukiah (Mendocino County), central California; west to Ukiah, Paicines (San Benito County), Ventura, San Pedro, San Diego, and 6 miles west of Mountain Spring, western California; Colorado River opposite the mouth of Hardy River, northwestern Sonora; Rancho Baillon, Papasquiaro, and Durango, western Durango; Rosario, southern Sinaloa; Chicalote, central Aguas Calientes; and Guanajuato, Guanajuato; south to Chimalpa (Valley of Mexico), Mexico; Puente de Ixtla, southern Morelos; and San Baltazar, Puebla; east to Jalapa, central western Vera Cruz; Alta Mira and Matamoros, eastern Tamaulipas; Brownsville, Corpus Christi, and Port O'Connor, central southern Texas. Winters regularly in central and southern Mexico, and in all of Central America: north to Chacala, Durango, rarely to Phoenix, Arizona;[3] west to Manzanillo, Colima; east to Orizaba, Vera Cruz, and Cozumel Island, Yucatan, in Mexico; and southeast through Guatemala, Honduras, Salvador, Nicaragua, Costa Rica, and Panama, to Cana, eastern Panama.

Remarks.—The present race differs from *Chordeiles acutipennis micromeris* in considerably larger size, broader light tail-bars, and rather paler, rather more brownish tone of the upper surface. It is much larger than *Chordeiles acutipennis acutipennis*, with broader light tail-bars, and is paler, more grayish, both above and below. The juvenal plumage is identical with that of *Chordeiles acutipennis inferior* hereinafter described.[4]

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[1] Fifteen specimens, from Texas, Arizona, and California.

[2] Here for the first time definitely restricted to this locality.

[3] Taken, December 27, 1897.

[4] See p. 110.

With large series of specimens for comparison from California, Arizona, New Mexico, and Texas, no geographical differences are observable, and the birds from all these areas evidently belong to the same subspecies. The apparently smaller size of the Texas males in the measurements given below is due to the smallness of the series. Birds from San Diego, southern California, are somewhat smaller than typical *Chordeiles acutipennis texensis*, and thus incline toward *Chordeiles acutipennis inferior*, but they are nearer the present form. Examples from the various geographic areas average in measurements as follows:

Localities.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Five males, from California	185.2	112.9	6	13.9	14.2
Five males, from Arizona	184.3	113.7	5.5	14.2	14.3
Five males, from Texas	180.7	108.3	6.1	13.9	14.1
Five females, from California	174.8	107.3	6.1	13.6	14.3
Five females, from Arizona	174.4	106.5	6.2	13.4	14.5
Five females, from Texas	175.9	104.4	5.6	13.3	13.9

The juvenal and first autumn plumages of this race are apparently identical in color with those of *Chordeiles acutipennis inferior*. The adults have about the same range of individual variation in color as that race, but are apparently more variable in size. The ochraceous phase is like that of *Chordeiles acutipennis inferior*, less marked than in *Chordeiles acutipennis acutipennis;* but the light and dark extremes are, however, just as distinct.

The two type specimens, adult and male and female, of *Chordeiles acutipennis texensis* are in the American Museum of Natural History. They are flat skins, obtained by Capt. J. P. McCown in Texas, and were originally in the collection of George N. Lawrence. The male, which, of course, is to be considered *the* type, is an abnormally small bird, as its measurements on page 109 show. It is marked in Lawrence' handwriting on the face of the label: "Chordeiles texensis, Lawr." "Texas" "♂ a 116;" and on the back of the label: "Type" "Presented by Capt. J. P. McCown." The label of the female is identical save for the sex and number, which read: "♀ b 116." In color both birds are inseparable from Texas specimens. There seems to be now no way of determining the exact locality at which these specimens were collected; and as it seems desirable to have an exact type-locality, I now designate as such Ringgold Barracks, near Rio Grande City, since this is a locality which Captain McCown is known to have visited.

The Texas nighthawk is normally only a summer sojourner in the United States, where it appears in March, as a specimen which Dr. E. A. Mearns obtained, March 21, 1894, on the Colorado River at the Mexican boundary attests. It leaves this country in September or October (taken, October 5, 1893, San Bernardino Ranch, Arizona, Dr. E. A. Mearns). It breeds from April to August, and there are eggs in the United States National Museum collected from April 27 to August 6, inclusive.

Specimens examined.—Total number, 293, from the localities listed below:

Arizona.—Colorado River, 5 miles north of Laguna (Apr. 21, 24, and 26, 1910); Ehrenberg (Mar. 27, 1910); Date Creek, south of Fort Whipple (June 5, 1865); San Bernardino Ranch, San Bernardino River, on the Mexican boundary line (Aug. 15 and 23, 1892; Oct. 5, 1893); Camp Grant, 40 miles east of Tucson (May 4, 1867); Fort Huachuca (May 23, 1892; June 3, 1892; June 15, 1891); Huachuca Mountains (June 3, 1891); Yuma (Apr. 5, 1884); Beaverdam (May 10, 1891); Fort Mojave (May 13, 1884; May 24, 1861); near San Pedro River in Cochise County (Aug. 15, 1890); Tucson (May 5, 1883; May 19, 1906; June 2 and 3, 1884; June 8, 1881; June 16, 1891); Calabasas (May 26, 1887); Colorado River at Monument No. 204, Mexican boundary line (Mar. 21 and 25, 1894); San Pedro slope, Santa Catalina Mountains, Pinal County (May 20, 1885; June 4, 1885 [3,500 feet altitude]; June 7, 1885 [3,000 feet altitude]); Fort Verde (June 3 and 5, 1885; June 17, 1884; Sept. 20, 1886); Charleston, Cochise County (June 21, 1896); Catalina Mill (June 21, 1884); Babacomari Creek.

California.—Pasadena (Mar. 31, 1896; Apr. 4, 7, 9, and 29, 1896; Apr. 27, 1895; Apr. 21, 24, and 30, 1897; May 2, 1894; June 19, 1897; July 26, 1902; Aug. 4, 1900; Aug. 30, 1906); San Fernando Valley, Los Angeles County (May 2, 1899; May 22, 1895); Sugarloaf Mountain, 7,500 feet altitude, San Bernardino Mountains (Aug. 5, 1905); Cactus Flat, 6,000 feet altitude, San Bernardino Mountains (Aug. 16, 1905); Cushenbury Springs, 4,000 feet altitude, San Bernardino Mountains (Aug. 9 and 13, 1905); Bodfish (June 17, 1911); Los Angeles (Apr. 14, 1898; May 2, 1897; June 20, 1897); San Fernando, Los Angeles County (Apr. 24, 1900; Aug. 14, 1897); Mecca, Riverside County (Apr. 2, 4, 7, and 11, 1908); Tipton, Tulare County (Apr. 26, 1911); Reche Canyon, near Colton (July 23 and 28, 1908); Isabella (July 1, 1911); Colorado River opposite Cibola, Arizona (Apr. 3, 1910); Dulzura (Apr. 24, 1908; June 29, 1894); Colorado River, 5 miles northeast of Yuma (May 3, 1910); Chula Vista, San Diego County (May 27, 1908); Paicines (June 12, 1898; July 10, 1898); Kelso Creek, 3,500 feet altitude, 11 miles south-southeast of Weldon, Kern County (July 6, 1911); Alhambra (Apr. 11, 12, and 15, 1889); Riverside (Apr. 10, 1885); Point Loma, San Diego County (June 19, 1908); San Diego (Apr. 20 and 30, 1885; June 7 and 13, 1892); Silsbee, Imperial County (Apr. 6, 1906); Riverside County (Apr. 21, 1907); Cabazon, Riverside County (May 16, 1908); Alila (June 18, 1903); Chowchilla, Merced County (June 27 and 28, 1900); Colorado River at Pilot Knob (taken with eggs, May 8, 1910); Ash Creek, Owens Lake (May 31, 1891); Bishop, in Owens Valley, altitude 4,000 feet (June 29, 1891); Coalinga, Fresno County (July 8, 1905); Lone Pine, Owens Valley (June 8, 10, 12, and 13, 1891); Bakersfield (July 19, 1891); Valley Springs (June 3, 1898); Unlucky Lake, San Diego County (Apr. 30, 1894); divide of mountains west of Coast Range, near Mexican boundary line, about 6 miles west of Mountain Spring, San Diego County (May 17, 1894); Marysville (July 1, 1891); South Fork of Kern River, 25 miles above Kernville (July 8, 1891); Keeler (June 2, 1891); Chinese Camp (Apr. 20 and 21, 1891); San Bernardino (July 30, 1885); Ukiah (Apr. 29, 1889); Vallevista, San Jacinto Valley (Sept. 2, 1908); Needles (Apr. 28, 1905); Ventura (June 1, 1906); Lanes Bridge, 10 miles north of Fresno (Apr. 12, 1911).

New Mexico.—Eastern foothills of Big Hatchet Mountains (July 20, 1908); State College (July 12 and 14, 1913); Dog Spring, southern Grant County (June 8, 1892); Apache, Grant County (May 17, 1886); Gila River (Sept. 14, 1873); Alamogordo (May 17, 1902); between Alamogordo and Dry Canyon, Otero County (May 7, 1902); 8 miles east of Deming (Sept. 4, 1908).

Texas.—Rio Grande City (Apr. 9, 11, and 16, 1880; June 1, 1891; June 15, 1889); Ringgold Barracks (July); Lomita Ranch, near Hidalgo (Apr. 23 and 26, 1878; May 5, 11, and 12, 1878; July 25 and 31, 1880; Aug. 16, 1880); Hidalgo (Apr. 18, 1877; May 5, 1877; May 7, 23, 25, and 27, 1889); Pecos City (May 25, 1887); eastern base of Chisos Mountains (June 23, 1901); Brownsville (Apr. 18, 1889; Apr. 20 and 21, 1892; July 2, 1892); Fort Hancock (June 9, 12, 18, and 21, 1893; Aug. 15, 1902); Frontera; Rio Grande in Cameron County (Apr. 16, 1886); Laredo (May 18, 1866; Sept. 5 and 13, 1866); Marathon (May 18, 1891); 15 miles south of Marathon (May 17, 1901); 20 miles south of Marathon (May 19, 1901); 65 miles south of Marathon (May 19, 1901); near Carrizo (May 19, 1891); Comstock (July 26, 1902); Langtry (May 1, 1903); Del Rio (May 19, 1903); Kerrville (May 18, 1910); Ysleta (July 25, 1901); Runge (Aug. 28, 1905).

Chihuahua.—Mosquito Springs (May 12, 1892); San Diego (Apr. 21 and 24, 1891; June 5, 1891); near Colonia Garcia (July 15 and 16, 1899).

Colima.—Plains of Colima (Jan. 14 and 15, 1890); Manzanillo (Jan. 26, 1892).

Durango.—Rancho Baillon, northwestern Durango, 7,800 feet altitude (May 9, 1903).

Guanajuato.—Guanajuato.

Jalisco.—La Barca (Jan. 4, 9, 17, and 19, 1903; Nov. 22 and 25, 1899; Dec. 2, 1899); Ocotlan (Jan. 4, 1903).

Lower California.—Carrizo Valley (Apr. 19, 1893); mouth of Hardy River (Apr. 2, 1905); Seven Wells, Salton River (Apr. 10, 1894).

Michoacan.—Patzcuaro (Dec. 22, 1891).

Morelos.—Cuernavaca (Jan. 3, 1893); Puente de Ixtla (June 6, 1903).

Nuevo Leon.—Montemorelos (May 20, 1889); Monterey (Apr. 24 and 27, 1889); Linares (Apr. 17, 1891); Santa Catarina (April, 1853).

Oaxaca.—Santa Efigenia (Jan. 3 and 12, 1869).

Sinaloa.—Escuinapa (Dec. 28, 1903); Mazatlan.

Sonora.—Colorado River opposite mouth of Hardy River (Mar. 28, 1894); San Marcial (Nov. 10, 1905).

Tamaulipas.—Rio Cruz (June 19, 23, and 30, 1909; July 7, 20, and 21, 1909); Santa Leonor (Apr. 14, 15, and 17, 1909); Montelunga (Apr. 27, 1909; and May 1, 1909); Mier (May 5, 1891).

Tepic.—Maria Madre Island, Tres Marias Islands (May 5, 1897).

Vera Cruz.—Jalapa (Apr. 2, 1897); Orizaba (Jan. 25, 1894).

Costa Rica.—Bolson (Dec. 25, 1907); El Rio Ciribí (Jan. 25, 1868); Limon (Nov. 28, 1896); Pigres (Mar. 3 and 10, 1905).

Guatemala.—Dueñas (Feb. 1, 1860).

Nicaragua.—San Juan de Nicaragua.

Panama.—Cana (Mar. 10, 1912).

Salvador.—La Union (January, 1864).

Measurements of specimens of Chordeiles acutipennis texensis.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm*
J. Grinnell 826[1]	Male	Pasadena, Cal	Apr. 4, 1896	J. Grinnell	183	112.5	5.2	14.5	14.5
J. Grinnell 308[1]	...do	.....do	Apr. 27, 1895	.....do	187.5	110	6.8	14	14
J. Grinnell 2448[1]	...do	.....do	Apr. 24, 1897	.....do	177	111.5	5.5	13.7	13.7
J. and J. W. Mailliard 4489[1].	...do	Chowchilla, Merced Co., Cal.	June 27, 1900		190.5	117.5	6.5	13.5	15
J. and J. W. Mailliard 4510[1].	...do	.....do	June 28, 1900		188	113	6	14	14
Am. Mus. N. H. 51992[1].	...do	Fort Verde, Ariz.	June 3, 1885	E. A. Mearns.	184	119	5.5	13.9	13.9
Am. Mus. N. H. 29377[1].	...do	San Pedro Slope, Santa Catalina Mountains, Pinal Co., Ariz.	June 4, 1885	W. E. D. Scott.	176	109	5.8	13.5	14
Am. Mus. N. H. 29373[1].	...do	Tucson, Ariz.	May 5, 1883	.....do	192	115	5	15	15
Am. Mus. N. H. 98978[1].	...do	.....do	May 19, 1906	F. M. Chapman and J. D. Figgins.	183.5	114	5.5	13.9	13.9

[1] Used in measurement averages on p. 104.

Measurements of specimens of Chordeiles acutipennis texensis—Continued.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
M. C. Z. 32306[1]	Male	Tucson, Ariz	June 8, 1881	F. Stephens	186	111.5	5.5	14.5	14.7
G. B. Sennett 6631[1]	...do	Hidalgo, Tex	May 7, 1889	J. A. Singley	183	108	5.5	14	14
Am. Mus. N. H. 81605[1].	...do	.....do	May 23, 1889	.....do	178	109	6.8	13	13
Am. Mus. N. H. 81607[1].	...do	.....do	May 27, 1889	.....do	183.5	111.5	6.2	14.5	14.5
U.S.N.M. 140414[1]	...do	Rio Grande City, Tex.	June 1, 1891	W. Lloyd	173	104	6.2	14	14
Am. Mus. N. H. 81614[1].	...do	Lomita, Tex	May 5, 1878	G. B. Sennett.	186	109	6	14	15
Am. Mus. N. H. 43852.	...do.[2]	Texas		J. P. McCown.	165	97	6	13	14
J. Grinnell 2449[1]	Female	Pasadena, Cal	Apr. 24, 1897	J. Grinnell	175	108	6	13.5	13.5
J. Grinnell 309[1]	...do	.....do	Apr. 27, 1895	.....do	175	110	6.1	13	14
J. Grinnell 2461[1]	...do	.....do	Apr. 30, 1897	.....do	174	106.5	6	13	13.8
J. Grinnell 2842[1]	...do	.....do	June 19, 1897	.....do	170	106	6	14.2	15
J. and J. W. Maillard 4485[1].	...do	Chowchilla, Merced Co., Cal.	June 27, 1900		180	106	6.5	14.5	15.1
Am. Mus. N. H. 29379[1].	...do	San Pedro Slope, Santa Catalina Mountains, Pinal Co., Ariz.	June 7, 1885	W. E. D. Scott.	178.5	104	6.2	13	14
Am. Mus. N. H. 29874[1].	...do	Tucson, Ariz	May 5, 1883	.....do	172	106	5.8	13.3	15
Am. Mus. N. H. 29369[1].	...do	.....do	June 2, 1884	.....do	168.5	106	6	12.5	13.8
Am. Mus. N. H. 29368[1].	...do	.....do	June 3, 1884	.....do	173	109	6	15.2	15.8
A. N. S. Phila. 27551[1].	...do	.....do	June 16, 1891	S. N. Rhoads	180	107.5	7	13.2	14
Am. Mus. N. H. 43851[1].	...do.[3]	Texas		J. P. McCown.	176.5	104	5.1	13.5	13.5
Field Mus. N. H. 43122[1].	...do	Hidalgo, Tex	Apr. 18, 1877		175	104	6.3	13.2	14.2
Am. Mus. N. H. 81603[1].	...do	Rio Grande City, Tex.	June 15, 1889		171	102	5.5	13	13
Am. Mus. N. H. 81613[1].	...do	Lomita, Tex	Apr. 26, 1878	G. B. Sennett.	180	105.5	6	13.5	14.3
U.S.N.M. 112391[1]	...do	.....do	May 11, 1878	.....do	177	106.5	5	13.3	14.5

[1] Used in measurement averages on p. 104.

[2] Type of male.

[3] Type of female.

CHORDEILES ACUTIPENNIS INFERIOR, new subspecies.

Chars. subsp.—Like *Chordeiles acutipennis micromeris*, but larger; light bars on tail broader; upper surface lighter, and averaging more brownish (less grayish) in general effect; similar to *Chordeiles acutipennis texensis*, but smaller.

Description.—Type, adult male, No. 113100, U.S.N.M.; Triunfo, Lower California, Mexico, June 14, 1887; M. Abbott Frazar. Upper parts light brownish gray, with a more or less evident tinge of buff (particularly on the scapulars, which have some spots of ochraceous), and mottled, vermiculated, and irregularly barred with brownish black, the scapulars more or less solidly black medially, the cervix rather duller and more uniform; tail-feathers fuscous, more or less irregularly and rather broadly barred with buff, cream buff, and whitish, these bars on the upper side of the tail much mottled and broken by fuscous; a much broader pure white subterminal band; wing-quills fuscous, all but the outer primaries more or less spotted or barred on both vanes with tawny, ochraceous or buff, having also a broad white bar on four outer primaries mostly posterior to the tip of the eighth primary; outer primaries slightly edged or spotted on outer web with buff; wing-coverts and tertials mottled, spotted, and vermiculated with white, buff, and ochraceous buff, much like the back; edge of wing along the alula mostly buffy or creamy white; lores and supraloral region mixed white, buff, and dark brown; auriculars and postocular region blackish brown, much mixed with tawny, ochraceous, buff, and a little with white; chin buffy gray, with posteriorly heavy markings of dark brown; cheeks and sides of neck dark brown, much spotted and streaked with ochraceous, buff, and whitish; a large triangular patch on throat white; below this a band of dark brown much spotted with ochraceous buff; breast dark brown, finely mottled and vermiculated with pale brownish; rest of lower surface ochraceous buff, paler (buff) on lower breast, with conspicuous dark brown cross-bars, these narrower, farther apart, and somewhat broken on lower tail-coverts; lining of wing deep ochraceous buff, barred with dark brown.

Iris dark brown.

Measurements.—Female: Total length (in flesh), 203–223.5 (average, 210.1) mm.;[1] extent of wing, 485–497.8 (492.8).[1]

Male:[2] Wing, 171.5–184.5 (average, 176.2) mm.; tail, 99–115 (107.1); exposed culmen, 4.9–6.5 (5.7); tarsus, 12.5–14.5 (13.5); middle toe, 13.2–15.1 (14).

Female:[3] Wing, 165–177 (168.1)mm.; tail, 99–105 (102.3); exposed culmen, 5.0–6.0 (5.4); tarsus, 12.1–13.7 (13); middle toe, 12.5–14.8 (13.7).

Type-locality.—Triunfo, Lower California, Mexico.

Geographical distribution.—Lower California. Breeds in the Upper Tropical, Lower Austral, and Upper Austral zones, south to San José del Cabo and Cape San Lucas; and north to La Grulla, Santa Cruz, and Valladares in the San Pedro Martir region of the northern part of the peninsula. Winters in extreme southern Lower California.

Remarks.—The juvenal plumage is similar to that of *Chordeiles acutipennis acutipennis*, but the lower parts average paler; and the upper surface is lighter, more uniform, more silvery, and less heavily mottled with blackish or dark brown. In the color of the upper parts it is strikingly like the first autumn stage of *Chordeiles virginianus howelli*,[4] but is lighter, more silvery, and usually less mottled with dark brown or blackish.

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[1] Three specimens.

[2] Ten specimens, from Lower California, Mexico.

[3] Nine specimens, from Lower California.

[4] See p. 60.

The difference between the gray and ochraceous phases of this subspecies are not nearly so great as in *Chordeiles acutipennis acutipennis* and *Chordeiles acutipennis micromeris*; that is, while the gray phase is practically identical in color with the corresponding phase of *Chordeiles acutipennis micromeris*, the ochraceous phase is not nearly so deeply ochraceous nor so different from the gray phase. The dark and light extremes in *Chordeiles acutipennis inferior* are, however, just as strongly marked as in the other races above mentioned.

Specimens examined.—The writer has seen 26 specimens of this new subspecies, from the localities that follow:

Lower California.—Cape San Lucas (Sept. 11, 14, and 21, 1859); San José del Cabo (Apr. 6, 1895; July 22, 1896; Aug. 5, 1896); Santa Anita (Jan. 14 and 16, 1906); Triunfo (June 11, 13, and 14, 1887); Valladares (May 21, 1889); Santa Cruz (May 23, 1889).

Measurements of specimens of Chordeiles acutipennis inferior.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
Carnegie Mus. 19857.[1]	Male....	Santa Cruz, Lower Cal.	Apr. 23, 1889	A. W. Anthony.	184.5	115	6	13.5	14
Carnegie Mus. 19856.[1]	...do.....	.....do...........	.....do.....	.....do......	176	112	6.2	12.5	13.2
Carnegie Mus. 19858.[1]	...do.....	Valladares, Lower Cal.	May 21, 1889	.....do......	172	105	6	13.5	13.5
Amer. Mus. N. H. 87445.[1]	...do.....	San José del Cabo, Lower Cal.	July 22, 1896	Loye Miller.	171.5	104	6.5	14.5	14.5
M.C.Z. 43535[1]......	...do.....	Cape San Lucas, Lower Cal.	....	....	174	104.5	5.2	13.5	13.8
Field Mus. N. H. 43123.[1]	...do.....	Triunfo, Lower Cal.	June 13, 1887	M. A. Frazar.	173	103	5.2	13.5	14
Am. Mus. N. H. 29834.[1]	...do.....	.....do...........	June 14, 1887	.....do......	177.5	109.5	5	13.8	14.8
Am. Mus. N. H. 29833.[1]	...do.....	.....do...........	June 11, 1887	.....do......	172	99	4.9	12.5	13.5
U.S.N.M. 113100[1].	...do[2]...	.....do...........	June 14, 1887	.....do......	184	108	5.5	13.8	15.1
U.S.N.M. 197784[1].	...do.....	Santa Anita, Lower Cal.	Jan. 16, 1906	E. W. Nelson and E.A.Goldman.	177	111	6	13.5	13.5
A. N. S. Phila. 35422.[1]	[Female]	Cape San Lucas, Lower Cal.	....	J. Xantus de Vesey.	165	99	5.2	13.7	14.8
Amer. Mus. N. H. 26782.[1]	Female .	.....do...........	Sept. 11, 1859	.....do......	165	102.5	6	12.1	13.1
M.C.Z. 17608[1]......	...do.....	.....do...........	....	.....do......	171	105	5	13.2	14
M.C.Z. 43536[1]......	...do.....	.....do...........	....	....	177	104.5	5	13	14.7
U.S.N.M. 13031[1]..	...do.....	.....do...........	....	J. Xantus de Vesey.	165	99	6	12.8	13.8
E. A. and O. Bangs 444.[1]	...do.....	Triunfo, Lower Cal.	June 13, 1887	M. A. Frazar.	167	103.5	5.3	12.5	12.5
U.S.N.M. 140412[1].	...do.....	San José del Cabo, Lower Cal.	Apr. 6, 1895	J. E. McLellan.	165	100.5	5.5	13	13.5
U.S.N.M. 197783[1].	...do.....	Santa Anita, Lower Cal.	Jan. 14, 1906	E. W. Nelson and E.A.Goldman.	169	102	5	13.5	13.5
U.S.N.M. 197785[1].	...do.....	.....do...........	Jan. 16, 1906	.....do......	169	104.5	5.5	12.9	13

[1] Used in measurement averages on p. 110.

[2] Type.

Table of comparative measurements of the subspecies of Chordeiles acutipennis.

MALES.

No. of specimens.	Name of subspecies.	Wing.			Tail.			Exposed culmen.			Tarsus.			Middle toe.		
		Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.
		mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
11	*Chordeiles acutipennis acutipennis*	150.5	172	163	84	102	93.6	4.8	6.8	5.8	11.5	14	12.6	12.1	15	13.6
2	*Chordeiles acutipennis exilis*	155	162	158.5	95	96.5	95.8	4.2	4.3	4.3	13.7	14.3	14	12.3	12.8	12.6
7	*Chordeiles acutipennis micromeris*	161.5	176	169.4	92.5	102.5	99.1	5	6.2	5.7	12.5	13.8	13.3	14	14.7	14.4
15	*Chordeiles acutipennis texensis*	173	192	183.4	104	119	111.6	5	6.8	5.9	13	15	14	13	15	14.2
10	*Chordeiles acutipennis inferior*	171.5	184.5	176.2	99	115	107.1	4.9	6.5	5.7	12.5	14.5	13.5	13.2	15.1	14

FEMALES.

No. of specimens.	Name of subspecies.	Wing.			Tail.			Exposed culmen.			Tarsus.			Middle toe.		
		Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.
10	*Chordeiles acutipennis acutipennis*	147.5	169	160	86.5	99	92.7	4.5	6.1	5.3	11.5	14	12.7	12	14.7	13.4
	Chordeiles acutipennis exilis	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
7	*Chordeiles acutipennis micromeris*	158.5	168	162.1	90	98.5	94.4	5	6.5	5.8	12	14	13.1	13	15.3	14.1
15	*Chordeiles acutipennis texensis*	168.5	180	175	102	110	106.1	5.1	7	6	12.5	15.2	13.5	13	15.8	14.2
9	*Chordeiles acutipennis inferior*	165	177	168.1	99	106	102.3	5	6	5.4	12.1	13.7	13	12.5	14.8	13.7

CHORDEILES RUPESTRIS (Spix).

Caprimulgus rupestris Spix, Avium Spec. Nov. Bras., vol. 2, 1825, p. 2, pl. 2 ("insulis petrosis fl. Nigri").[1]

Chars. sp. (*adult male*).—First (outermost) primary longer than second; shortest secondary usually reaching or exceeding the tips of the primary coverts; distance from bend of folded wing to end of shortest secondary nearly always greater than from latter point to end of fourth primary (counting from the outermost); tips of tail-feathers rounded; upper surface varied with dark brown, whitish, buff, and ochraceous; tail chiefly white, the two middle rectrices, most of the next pair, the outer webs of outermost pair, and broad tips to all, brown; middle portion of inner primaries and basal portion of nearly all the secondaries pure white; the remaining portions of these quills, together with the three outer primaries and the primary coverts, plain fuscous, unspotted; axillars and middle portion of under wing-coverts pure white; lower surface pure white; the jugulum and upper breast spotted and the former more or less clouded with pale brownish gray or grayish brown.

Adult female.—Similar to the adult male, but smaller; upper parts more ochraceous or buffy, less closely vermiculated, and rather lighter; fourth primary (counting from the outermost) with usually at least a small spot of white on middle part of inner web; tail with the broad brown tips much mottled with lighter, instead of usually plain brown or nearly so; those rectrices that are mostly white having more dark brown at base (commonly none in the male), and the white area of inner web with one or two spots or bars of dark brown; outer web of outermost rectrix all brown without a subterminal white area, and this brown much, instead of little or not all, mottled with lighter.

Remarks.—The present species seems to be a comparatively rare one, and the small number of specimens now available precludes any satisfactory elucidation of the various plumages, molt, variation, and the many other problems connected with every species. Individual variation seems to concern chiefly size; the shade of the markings on the breast; the amount of white on the greater wing coverts; and the coarseness of the markings on the upper surface.

Geographical distribution.—The geographical distribution of *Chordeiles rupestris* is entirely in northern and central South America, and extends from northern Brazil to Colombia, Peru, and Bolivia. To the single race previously recognized the present investigation adds two, one from central Colombia, the other from eastern Peru. Both of these, however, are known from only a limited area, and by far the greater part of the total range of the species is occupied by the typical subspecies, *Chordeiles rupestris rupestris*.

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[1] Further synonymy under subspecies.

Habits.—So far as known, this species is nonmigratory, and in general habits similar to the other members of the genus. It is said to breed often in colonies in September on the sand banks and beaches of the Amazon River and its tributaries; and its eggs are described as creamy or buffy white with numerous grayish markings.

Phylogeny.—The Brazilian subspecies *Chordeiles rupestris rupestris*, seems, from its wide geographical distribution and central location, to be the oldest form. Both *Chordeiles rupestris xyostictus* and *Chordeiles rupestris zaleucus* are thus doubtless more recent offshoots, merely geographic races modified into such by isolation or environment.

History.—This species was first described by Spix, in his famous work on the birds of Brazil,[1] from specimens obtained on the Rio Negro. Its literature is limited, and it appears to have no synonyms. All the references to its literature, so far as possible, will be given under the headings of the subspecies, as perhaps of interest.

CHORDEILES RUPESTRIS RUPESTRIS (Spix).

Caprimulgus rupestris Spix, Avium Spec. Nov. Bras., vol. 2, 1825, p. 2, pl. 2 ("insulis petrosis fl. Nigri").

C[*hordeiles*]. *rupestris* Gray, Genera Birds, vol. 1, January, 1847, p. 49.

[*Chordeiles*] *rupestris* Bonaparte, Consp. Gen. Avium, vol. 1, 1850, p. 63.—Gray, Hand-List Gen. and Spec. Birds, vol. 1, 1869, p. 61 (part, Rio Negro, Brazil).—Giebel, Thesaur. Ornith., vol. 1, 1872, p. 669 (part).—Sclater and Salvin, Nomencl. Avium Neotrop., 1873, p. 96 (Amazonia).—Sharpe, Hand-List Gen. and Spec. Birds, vol. 2, 1900, p. 80 (part, Amazonia).

Chordeiles rupestris Burmeister, Syst. Uebers. Thiere Bras., vol. 2, 1856, p. 393 (Rio Negro, Brazil).—Sclater, Cat. Amer. Birds, 1862, p. 279 (upper Amazon River); Proc. Zool. Soc. Lond., 1866, p. 135 (part, rocky islands of Rio Negro, Brazil).—Sclater and Salvin, Proc. Zool. Soc. Lond., 1867, p. 583 (upper Rio Negro, Brazil).—Pelzeln, Ornith. Bras., 1868, p. 14 (Rio Guaporé; Rio Mamoré; Manaqueri, Rio Solimoēns, Brazil).—Sclater and Salvin, Proc. Zool. Soc. Lond., 1879, p. 626 (Prov. Moxos, Bolivia).—Hartert, Cat. Birds Brit. Mus., vol. 16, 1892, p. 617 (crit.; part; Para and Pernambuco, Brazil); Tierreich, Lief. 1, 1897, p. 20 (crit.).—Nehrkorn, Kat. Eiersammlung, 1899, p. 158 (eggs, Amazon River).—Ihering, Rev. Mus. Paulista, vol. 4, 1900, p. 257 (descr. eggs); vol. 6, 1905, p. 443 (Rio Juruá, Brazil).—Goeldi, Album Aves Amazonicas, fasc. 3, 1906, pl. 46, fig. 8 (Rio Purús, Brazil).—Ihering and Ihering, Cat. Fauna Bras., vol. 1, Aves, 1907, p. 132 (part; Matto Grosso; Rio Amazonas; Para; Rio Negro; Pernambuco; Rio Juruá; and Amazonas, Brazil; Bolivia).—Snethlage, Journ. f. Ornith., January, 1908, p. 18 (Cachoeira and Bom Lugar on Rio Purús, Brazil).—Hellmayr, Novit. Zool., vol. 17, December, 1910, p. 378 (part, Jamarysinho, on Rio Madeira, Brazil).

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[1] Avium Spec. Nov. Bras., vol. 2, p. 2, pl. 2.

Chars. subsp.—Size small; colors relatively dark; blackish and dark brown markings of upper surface rather coarse; breast sparsely spotted; female with only dark brown spots on inner webs of outer rectrices; and with no large white patch on inner vane of fourth primary (counting from the outermost).

Description.—Adult [male], No. 21995, Academy of Natural Sciences of Philadelphia; Rio Negro, Brazil; M. Wülf. Upper surface broccoli brown, spotted, streaked, barred, and vermiculated with grayish sepia, most heavily on pileum, scapulars, and upper tail-coverts, and in places tinged with buff, the outer margins of scapulars almost entirely buff; tail white, the two middle feathers hair brown, irregularly barred and finely mottled with dark brown; the outer vane of outermost rectrix (excepting a very narrow white edge and a broad subterminal white space) and broad tips on all the rectrices, save the middle pair, dark brown, between clove brown and hair brown; primaries of the same brown, the four outermost unmarked, the next four with their bases (excepting the outer vanes) and all but the broad brown tips, pure white; rest of primaries and all of secondaries narrowly tipped with whitish and otherwise all white save for broad, dark brown ends; anterior rows of superior wing-coverts dark brown like the wing-quills, spotted and imperfectly barred with buff and whitish; remainder of wing-coverts deep broccoli brown, spotted, barred, mottled, and tipped with white, cream color, pale clay color, and buff; tertials broccoli brown, terminally dull buff, with shaft streaks and broken, irregular bars and vermiculations of deep broccoli brown; sides of head and neck broccoli brown, with fine markings of dark brown, the auriculars buffy and nearly plain; an indistinct buffy white superciliary stripe; entire lower surface creamy white, the jugulum with a wide, grayish buff, partly whitish band, obscurely barred and spotted with broccoli brown; lining of wing white, excepting the outer coverts, which are dark brown like the wing-quills, and the posterior ones, which are grayish drab; edge of wing along the alula mostly white.

Measurements.—Male:[1] Wing, 167–170 (average 168.5) mm.; tail, 94; exposed culmen, 6.5; tarsus, 13–13.5 (13.3); middle toe, 13–13.2 (13.1).

Female:[2] Wing, 159.5 mm.; tail, 90; exposed culmen, 5.0; tarsus, 12; middle toe, 13.

Type-locality.—Rocky islands of the Rio Negro, northern Brazil.

Geographical distribution.—Permanently resident in northern and central Brazil and northeastern Bolivia: north to Para and the upper

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[1] Two specimens, from Brazil.

[2] One specimen, from Brazil.

Rio Negro, Brazil; west to the upper Rio Negro; the Rio Juruá; Cachoeira and Bom Lugar on the Rio Purús; Jamarysinho on the Rio Madeira; the Rio Guaporé, Brazil; the Moxos region, northeastern Bolivia; and Matto Grosso, Brazil; south to Matto Grosso and Pernambuco, Brazil; and east to Pernambuco and Para, Brazil.

Remarks.—Individual and sexual variation have been already discussed in the account of the species above. This race, so far as reported, occupies a much larger geographical area than the others, and its known range will probably greatly increase as the result of future explorations. All of the specimens examined will be found listed in the table of measurements appended.

Measurements of specimens of Chordeiles rupestris rupestris.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 148368[1]	[Male.]	Brazil			170	94	6.5	13	13
A.N.S.Phila.21995.[1]	[Male.]	Rio Negro, Brazil		M. Wülf	167	94	6.5	13.5	13.2
A.N.S.Phila.21996.[1]	[Female.]	do		do	159.5	90	5	12	13

[1] Used in measurement averages on p. 115.

CHORDEILES RUPESTRIS XYOSTICTUS, new subspecies.

Chars. subsp.—Similar to *Chordeiles rupestris rupestris*, but somewhat larger; upper surface, including the wing-coverts, much paler, more buffy (less grayish), the dark markings much smaller; and breast more heavily spotted.

Description.—Type, adult male, No. 16599, U.S.N.M.; Bogota, Colombia; W. Evans. Upper surface pale drab, shading to ochraceous buff on the outer part of the scapulars, spotted, vermiculated, obscurely streaked, and narrowly and brokenly barred with broccoli brown, the barring most evident on upper tail-coverts and scapulars, the scapulars also a little barred and narrowly streaked with dark brown, between clove brown and hair brown, and the pileum conspicuously streaked with the same; tail cream white, the two central feathers basally rather light broccoli brown, distally hair brown, irregularly barred and finely mottled with a dark grayish brown, between clove and hair brown; the outer vane of outermost rectrix (excepting a very narrow light brownish edge and a broad subterminal white space) and broad tips on all the rectrices save the middle pair, of the same dark brown as the bars on the middle tail-feathers; primaries of the same brown, but somewhat darker, the four outermost unmarked, the next four with their bases (excepting the outer vanes) and all but the broad brown tips, cream white; rest of primaries and all of secondaries narrowly tipped with whitish (the secondaries more so), and otherwise all white save for broad dark brown ends; the tips of the two inner secondaries somewhat mottled with pale drab; innermost secondary and the tertials light drab, mottled, vermiculated, and narrowly and irregularly barred with broccoli brown, basally also with whitish and buffy; anterior rows of upper wing-coverts dark brown like the wing-quills, much spotted, mottled, and imperfectly barred with buff and whitish; remainder of wing-coverts deep broccoli brown, spotted, barred, mottled, and tipped with white, cream color, pale clay color, and buff; sides of head and neck pale buffy gray, more buffy on auriculars, which are narrowly and inconspicuously streaked with brown, all the rest speckled, spotted, and a little streaked and barred with broccoli brown, the streaks darker brown; lores anteriorly whitish; an ill-defined superciliary stripe due to the sparseness of the dark spotting; entire lower surface cream white, the jugulum with a wide band of drab gray, obscurely spotted and barred with drab and broccoli brown, the breast conspicuously spotted and imperfectly barred with broccoli brown; inferior wing-coverts cream white, the outer ones dark brown like the wing-quills, somewhat spotted and edged with buff, ochraceous, and whitish, the posterior and longest grayish drab; edge of wing along the alula mostly buffy white.

Measurements.—Male:[1] Wing, 172.5 mm.; tail, 100; exposed culmen, 7.0; tarsus, 13.1; middle toe, 13.1.

Female:[2] Wing, 165.5 mm.; tail, 92.5 mm.; exposed culmen, 7.0; tarsus, 13.1; middle toe, 13.9.

Type-locality.—Bogota, Colombia.

Geographical distribution.—Central Colombia. Probably a permanent resident.

Remarks.—This species (*Chordeiles rupestris*) has hitherto been unrecorded from Colombia, and it must be rare in that country. The two specimens listed in the subjoined table of measurements were collected at Bogota, Colombia, by Mr. W. Evans, and have been in the United States National Museum since 1860. They seem to represent a very well characterized geographical race.

Measurements of specimens of Chordeiles rupestris xyostictus.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
U.S.N.M. 16599[3]...	[Male][4]..	Bogota, Colombia	....	W. Evans...	172.5	100	7	13.1	13.1
U.S.N.M. 16600[3]...	[Female]	.....do............	....	.....do.......	165.5	92.5	7	13.1	13.9

[1] One specimen, from Colombia.

[2] One specimen, from Colombia.

[3] Used in measurement averages on p. 117.

[4] Type.

CHORDEILES RUPESTRIS ZALEUCUS, new subspecies.

Chordeiles rupestris SCLATER, Proc. Zool. Soc. Lond., 1866, p. 135 (part, lower Ucayali River, eastern Peru).—SCLATER and SALVIN, Proc. Zool. Soc. Lond., 1866, p. 193 (lower Ucayali River, eastern Peru); 1873, p. 290 (lower Ucayali River and entire Huallaga River [breeding], eastern Peru).—TACZANOWSKI, Ornith. Pérou, vol. 1, 1884. p. 214 (upper Ucayali River, Huallaga River, and Pebas, Peru).—HARTERT, Cat. Birds Brit. Mus., vol. 16, 1892, p. 617 (part, Ucayali River, Yquitos, and Pebas, Peru).—OATES and REID, Cat. Coll. Birds' Eggs Brit. Mus., vol. 3, 1903, p. 58 (Ucayali River, Peru).—IHERING and IHERING, Cat. Fauna Bras., vol. 1, Aves, 1907, p. 132 (part, eastern Peru).—HELLMAYR, Novit. Zool., December, 1910, p. 378 (part) (Peru).

[*Chordeiles*] *rupestris* GRAY, Hand-List Gen. and Spec. Birds, vol. 1, 1869, p. 61 (part, lower Ucayali River, Peru).—SHARPE, Hand-List Gen. and Spec. Birds, vol. 2, 1900, p. 80 (part, Bolivia, Peru).

Chars. subsp.—Resembling *Chordeiles rupestris rupestris*, but *female* more grayish above, particularly on wing-coverts; with a large white patch 47 mm. long on middle portion of inner web of fourth primary (counting from the outermost), this patch reaching to the shaft, which is white itself at this point; inner web of outermost rectrix with two broad dark brown bands (instead of spots) besides the terminal and the basal bands; spots on breast larger and more numerous.

Description.—Type, adult [female],[1] No. 55318, U.S.N.M., Pebas, Peru; Prof. James Orton; original number, 275. Upper surface light drab (the scapulars exteriorly largely buff or ochraceous buff), finely and confusedly spotted, streaked, barred, and vermiculated with dull white, darker drab, broccoli brown, grayish sepia, and grayish clove brown, the darkest brown markings mostly confined to pileum, scapulars, and upper tail-coverts, the pileum and middle of back more streaked, the posterior upper parts more barred; tail largely cream white, but basal portion of the feathers, and two (on some of the feathers only one) broad but somewhat broken and incomplete bars, of a dark brown, between clove brown and hair brown; ends of rectrices, except middle pair, with a wide band of the same dark brown, though much mottled above and below with lighter brown; outer webs of outermost and all of the next to the middle pairs of rectrices partly light, partly darker, broccoli brown, mottled and more or less irregularly barred with the dark brown of their tips; middle pair of feathers basally broccoli brown, distally rather grayish hair brown, finely mottled and vermiculated, particularly on terminal half, with the dark brown of the rest of the tail, and crossed by six rather narrow, and distally much broken bars of the same dark brown; primaries of the same dark brown as the tips of the tail-feathers, but somewhat more grayish, the three outer quills unmarked, the fourth with a large white spot on the middle portion of the inner vane, this spot 47 mm. long on the inner edge of the vane, 29 mm. in length along the shaft, which for this space is also white; remaining primaries mostly white, with some dark brown at the bases, principally on outer webs, and with broad dark brown ends which have narrow paler or whitish tips; secondaries, except the innermost three, chiefly white, with basal portion of inner webs and broad ends dark brown, the latter somewhat mottled with lighter brown and narrowly tipped with brownish white; the next secondary white, but with an increased amount of dark brown on the base and on outer vane; the end also broadly dark brown, mottled with lighter and tipped with whitish, but with an additional broad bar of dark brown; next secondary (the second from innermost) nearly all dark brown, with a large spot of cream white on the middle portion of inner web, several spots of pale brownish buff, and a narrow tip of brownish white; innermost secondary and the tertials light broccoli brown, terminally inclining to buff, vermiculated, and irregularly and narrowly barred with dark broccoli brown; anterior rows of lesser wing-coverts dark brown like the wing-quills, spotted, barred, and tipped with buff, pale brown, and brownish white; remaining upper wing-coverts also dark brown, but so heavily spotted, vermiculated, and irregularly barred with pale broccoli brown, buff, ochraceous buff, cream buff, pale clay color, and brownish white as to appear very much like the upper parts, though decidedly lighter; sides of head and neck for the most part finely mottled with dull white, cream buff, grayish hair brown, and broccoli brown, the ear-coverts nearly plain light clay color, with a few narrow streaks of dark brown, the postauricular region ochraceous buff, with conspicuous dark brown streaks; chin buffy white, with a few obscure brownish spots; broad crescent on throat, white; jugulum pale grayish buff, with broad streaks of dull white, numerous small spots, and narrow, more or less imperfect, bars of broccoli brown; remainder of lower parts cream white, the breast with broken bars and spots of broccoli brown; axillars cream white; inner lower wing-coverts also cream white, unmarked, the outer ones dark brown like the wing-quills, conspicuously spotted and brokenly barred with cream white, cream color, cream buff, and ochraceous buff; posterior lower wing-coverts plain light brownish gray.

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[1] Marked "male" on the original label.

Measurements.—Female (type): Wing, 162 mm.; tail, 89; exposed culmen, 7.5; tarsus, 13.5; middle toe, 14.

Taczanowski[1] gives the following dimensions of a male: Wing, 162 mm.; tail, 87; middle rectrix, 76; bill, 23;[2] bill from nostril, 5.0; tarsus, 13. Of a female: Wing, 153; tail, 89; middle rectrix, 75; bill, 24;[2] bill from nostril, 5.0; tarsus, 13.

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[1] Ornith. Pérou, vol. 1, 1884, p. 215.

[2] Measured probably from rictus.

Type-locality.—Pebas, Peru.

Geographical distribution.—Resident in eastern and central Peru: north to Pebas and Yquitos, northern Peru; west to the Huallaga River, central Peru; south to the upper Ucayali River, southern Peru; and east to the latter locality and to Pebas in northeastern Peru.

Remarks.—Although the writer has seen but a single specimen of this race, it is apparently easily recognizable by the character of the white markings on the primaries alone, though it can be distinguished also by its other characters. It differs from *Chordeiles rupestris xyostictus* in having somewhat shorter wings and tail; in the female, by reason of its rather darker and decidedly less buffy upper surface; rather larger dark brown markings on head, back, scapulars, and wing-coverts; a large white patch on the fourth primary; dark brown bars, instead of only spots, on the inner vane of outermost tail-feather; and less buffy jugulum. C. E. Hellmayr mentions[1] the darker upper surface of Peruvian specimens of *Chordeiles rupestris*, but gives no other differences.

The probable range of this subspecies is as above outlined, but since we have examined actual specimens from only Pebas, Peru, its geographical limits may be subject to change when adequate material is available.

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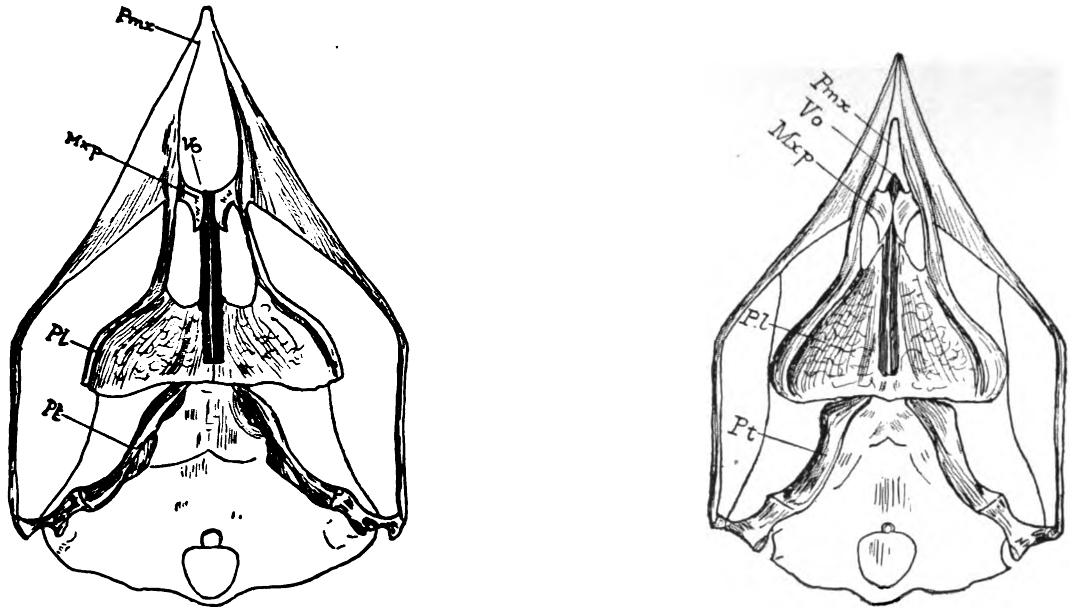
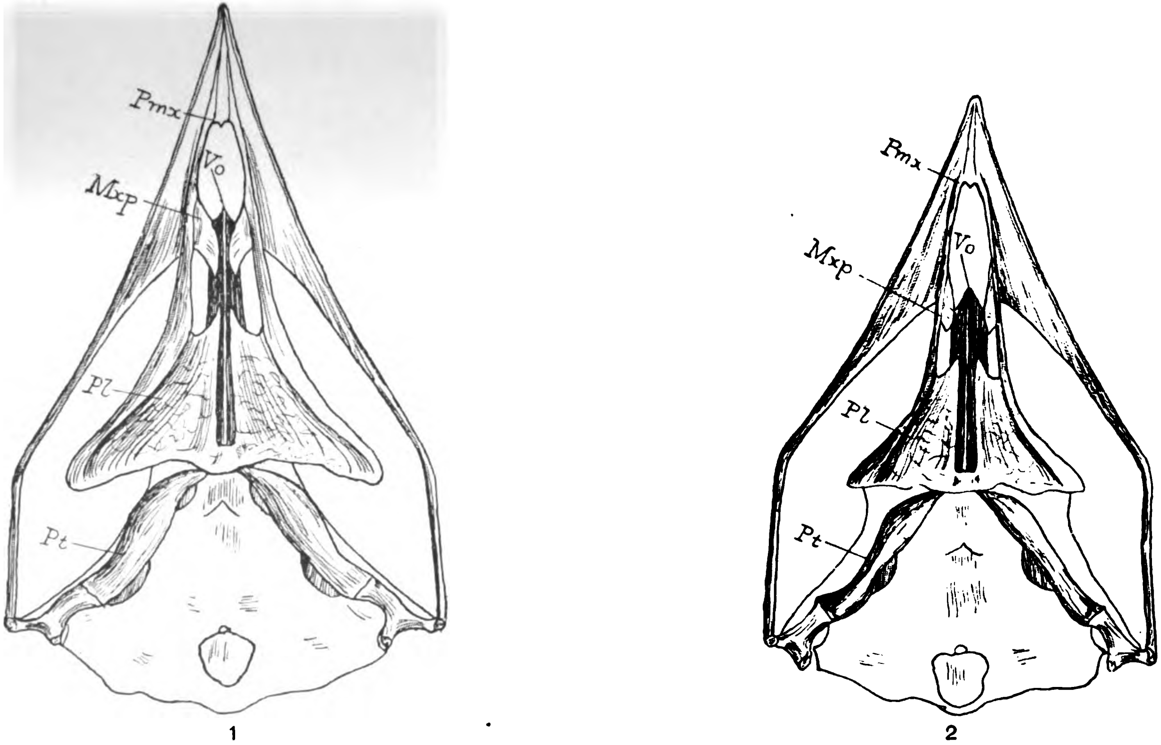
[1] Hellmayr, Novit. Zool., vol. 17, December, 1910, p. 378.



1 2

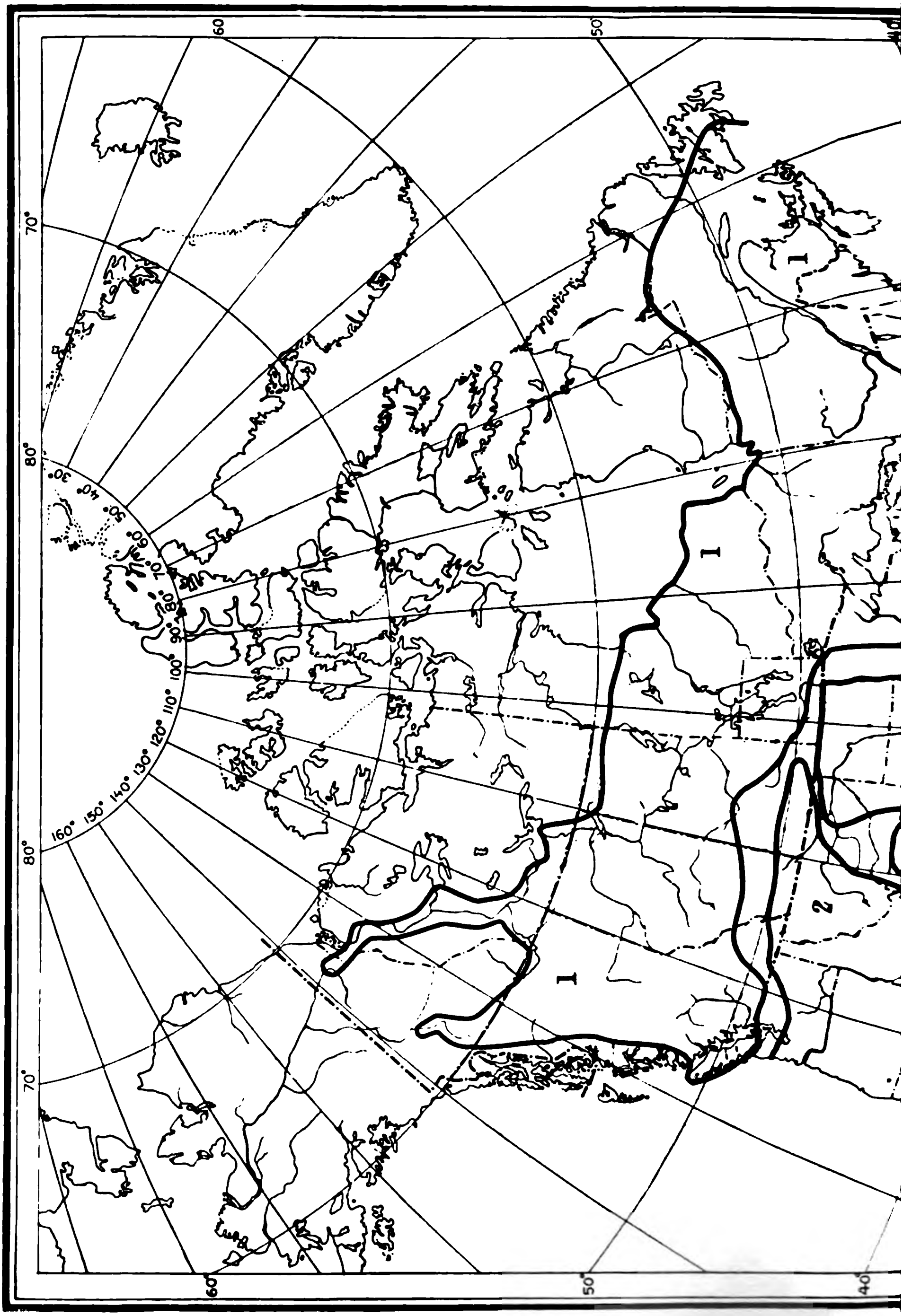
PALATAL SURFACE OF (1) CAPRIMULGUS EUROPAEUS (AFTER HUXLEY) (X 2), AND (2) CHORDEILES VIRGINIANUS VIRGINIANUS (X 2).

Mxp., maxillo-palatine; *Pl.*, palatine; *Pmx.*, premaxillary; *Pt.*, pterygoid; *Vo.*, vomer.



PALATAL SURFACE OF (1) ANTROSTOMUS CAROLINENSIS (X 2), AND (2) SETOCHALCIS VOCIFERA VOCIFERA (X 2).

Mxp., maxillo-palatine; *Pl.*, palatine; *Pmx.*, premaxillary; *Pt.*, pterygoid; *Vo.*, vomer.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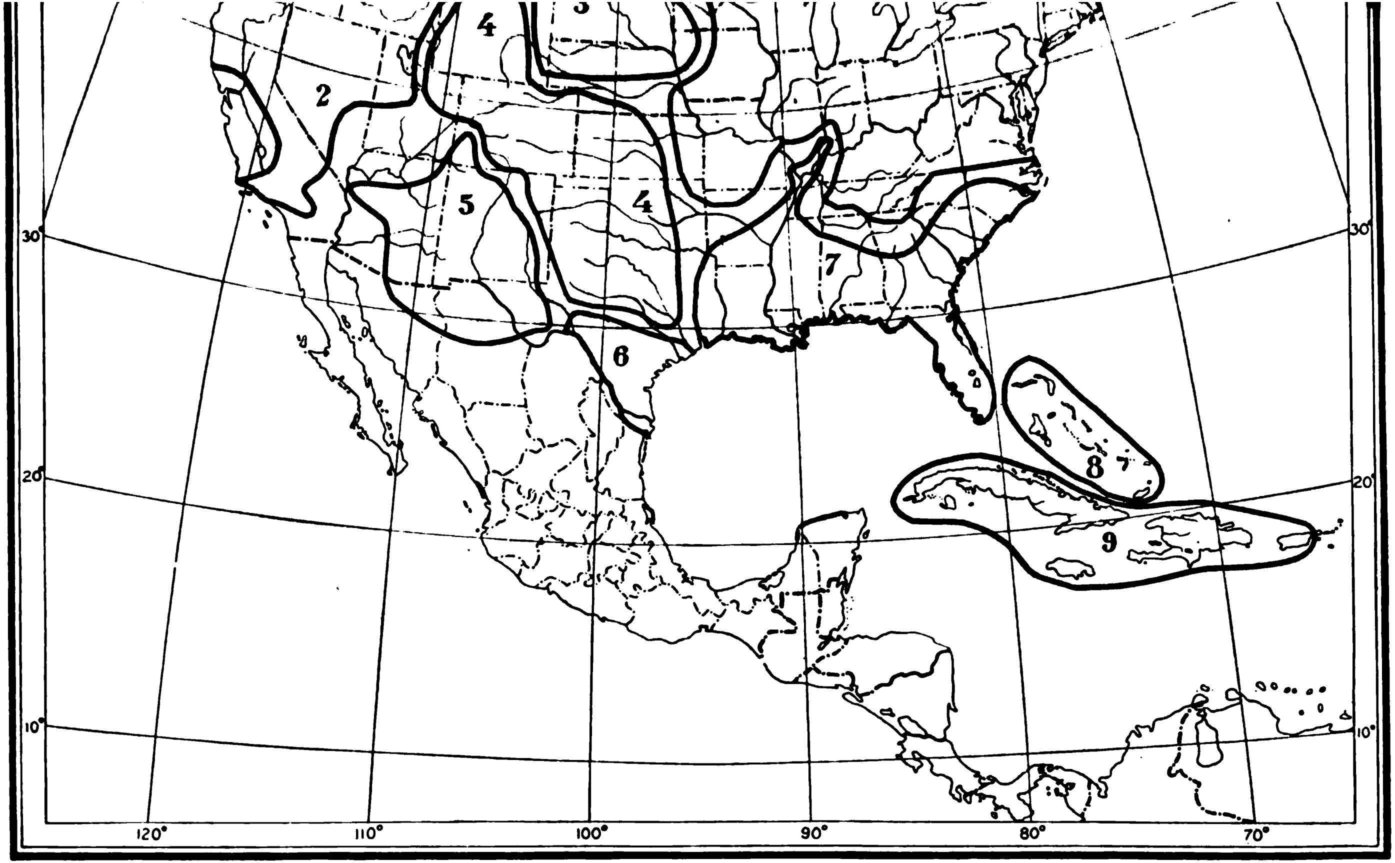
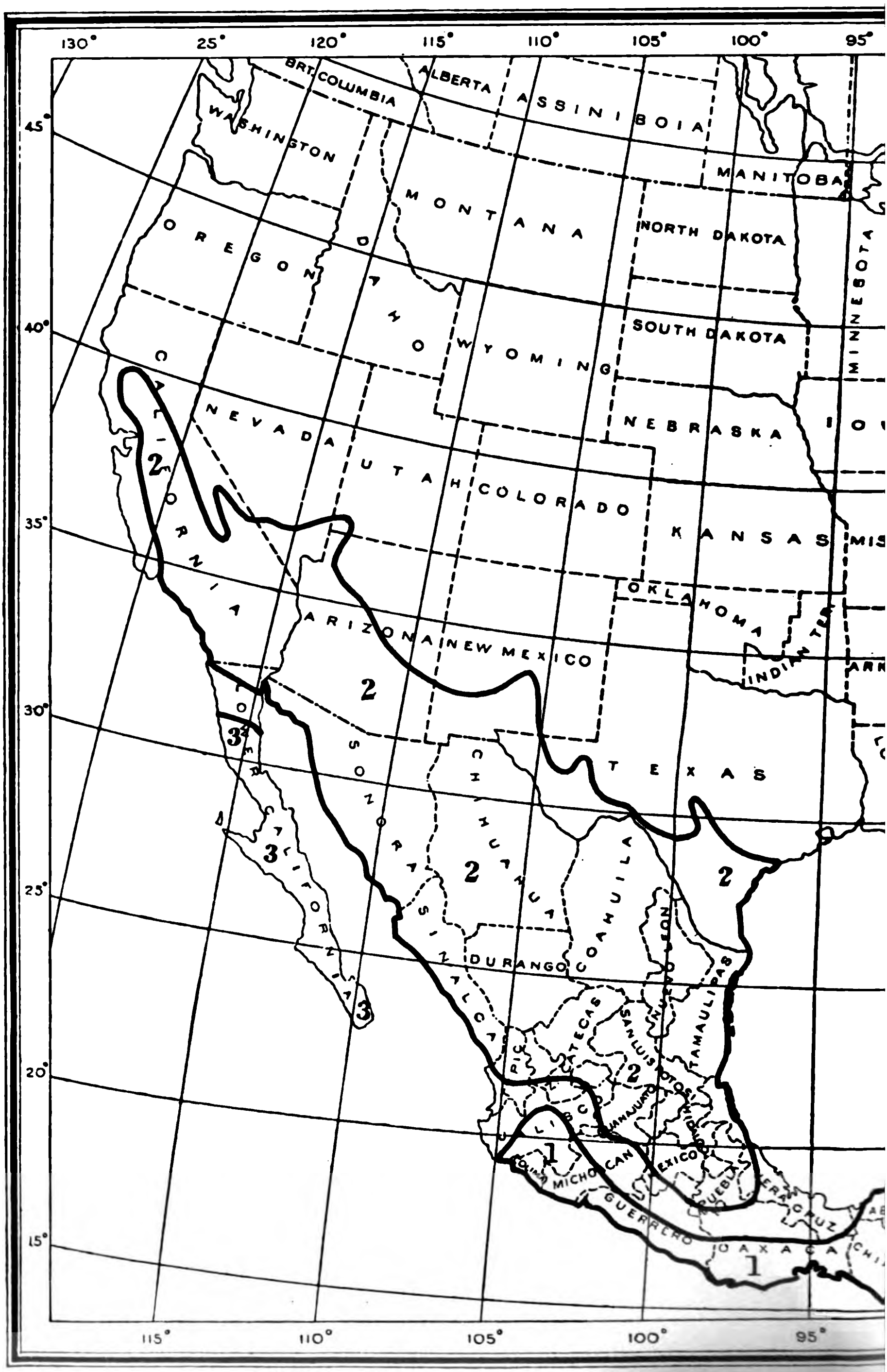


BREEDING RANGES OF THE SUBSPECIES OF CHORDEILES VIRGINIANUS.

1. Chordeiles virginianus virginianus.
2. Chordeiles virginianus hesperis.
3. Chordeiles virginianus sennetti.
4. Chordeiles virginianus howelli.
5. Chordeiles virginianus henryi.
6. Chordeiles virginianus aserriensis.
7. Chordeiles virginianus chapman
8. Chordeiles virginianus vicinus.
9. Chordeiles virginianus minor.



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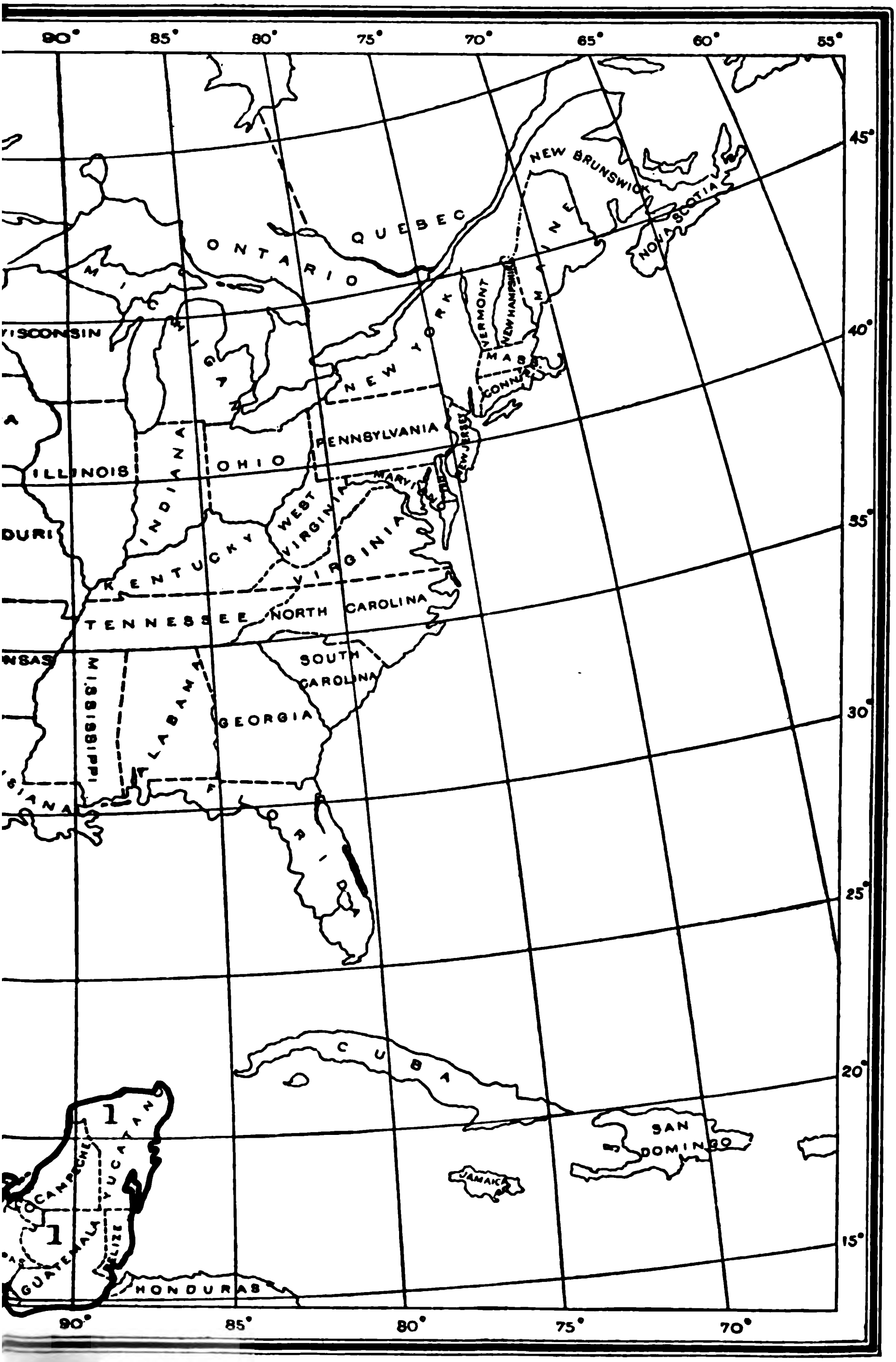

ᴛʜ AMERICAN SUBSPECIES OF CHORDEILES ACUTIPENNIS.

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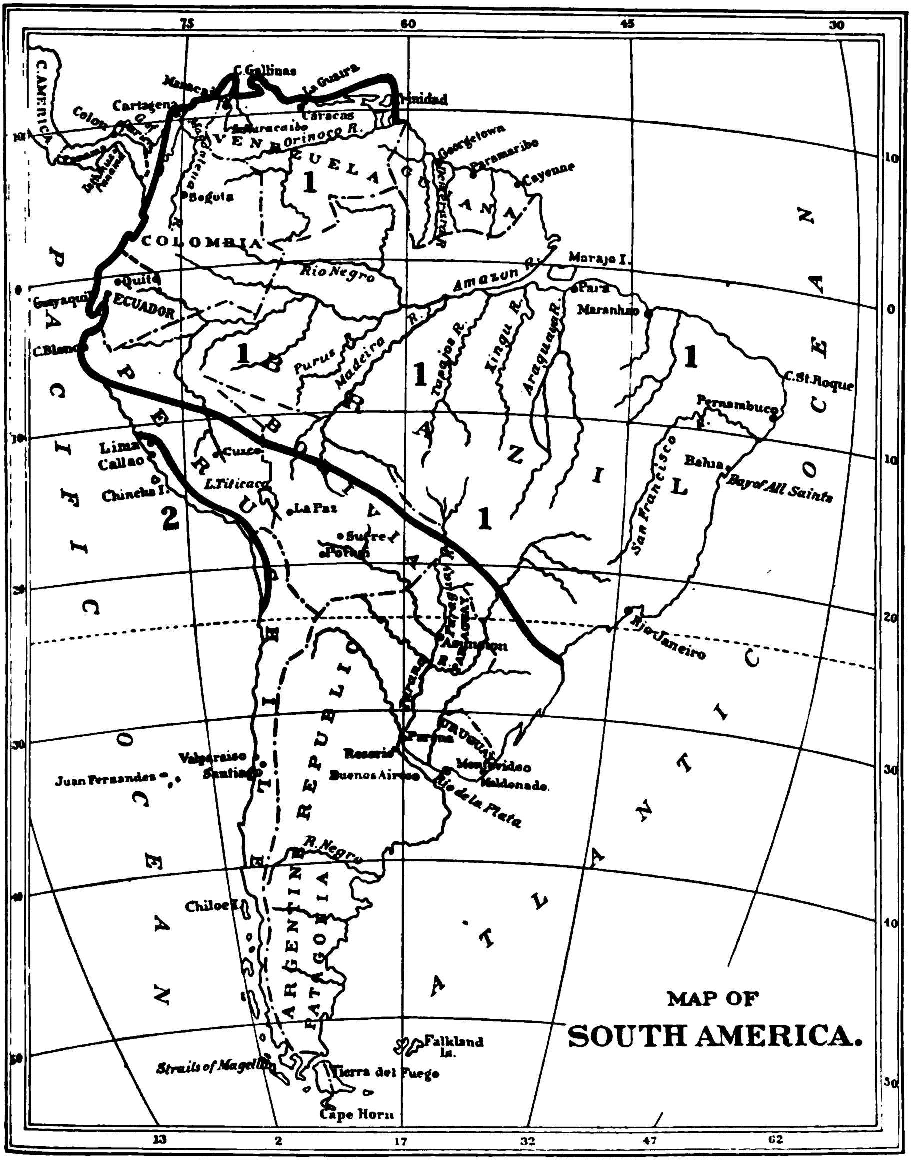
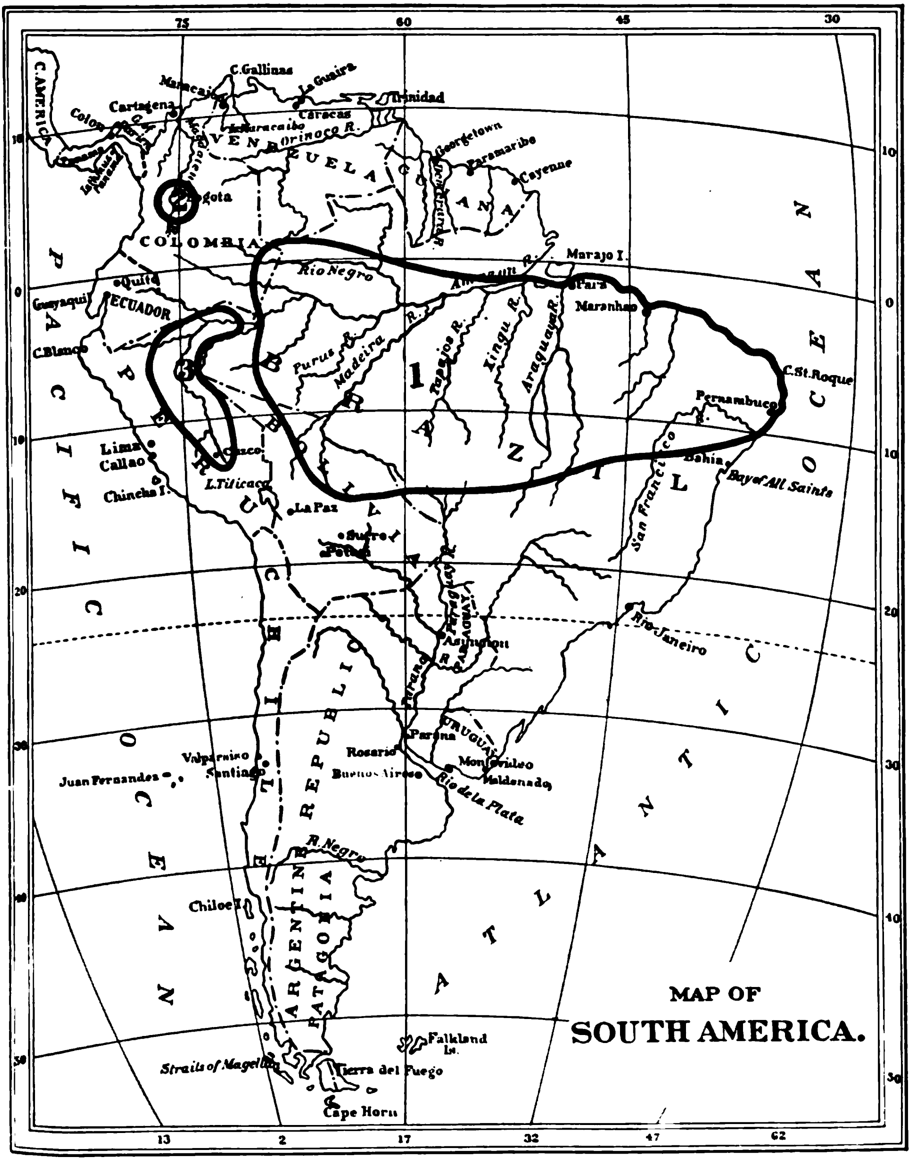


BREEDING RANGES OF THE SOUTH AMERICAN SUBSPECIES OF CHORDEILES ACUTIPENNIS.

1. Chordeiles acutipennis acutipennis.
2. Chordeiles acutipennis exilis.



BREEDING RANGES OF THE SUBSPECIES OF CHORDEILES RUPESTRIS.

1. Chordeiles rupestris rupestris.
2. Chordeiles rupestris xyostictus.
3. Chordeiles rupestris zaleucus.

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[Figures in black-faced type indicate family, generic, specific, or subspecific headings.]

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